MINUTES OF EVIDENCE

TAKEN BEFORE THE

INDIAN COTTON COMMITTEE

VOLUME I

AGRICULTURAL

PART I

MINUTES OF EVIDENCE FROM UNITED PROVINCES, CENTRAL PROVINCES, BURMA, NORTH-WEST FRONTIER PROVINCE, PUNJAB AND SIND



CALCUTTA
SUPERINTENDENT GOVERNMENT PRINTING, INDIA
1920

Agents for the Sale of Books Published by the

Superintendent of Government Printing, India, Calcutta.

IN EUROPE.

Constable & Co., 10, Orange Street, Leicester Square, London, W.C.
Kegan Paul, Trench, Trübner & Co., 68-74, Carter Lane, E.C., and 25, Museum Street, London, W.C.
Bernard Quaritch, 11, Grafton Street, New Bond Street, London, W.
P. S. King & Sons, 2 & 4, Great Smith Street, Westminster, London, S.W.
H. S. King & Co., 65, Cornhill, E.C., and 9, Pall Mall, London, W.
Grindlay & Co., 54, Parliament Street, London, S.W.
Luzac & Co., 46, Great Russell Street, London, W.C.
W. Thacker & Co., 2, Creed Lane, London, E.C.
T. Fisher Unwin, Ltd., No. 1, Adelphi Terrace, London, W.C.
Wm. Wesley & Son, 28, Essex St., Strand, London.
B. H. Blackwell, 50 & 51, Broad Street, Oxford.
Deighton, Bell & Co., Ltd., Cambridge.
Oliver and Boyd, Tweeddale Court, Edinburgh.
E. Ponsonby, Ltd., 116, Grafton Street, Dublin.
Ernest Leroux, 28, Rue Bonaparte, Paris.
Martinus Nijhoff, The Hague, Holland.

IN INDIA AND CEYLON.

Thacker, Spink & Co., Calcutta and Simla.
Newman & Co., Calcutta.
R. Cambray & Co., Calcutta.
S. K. Lahiri & Co., Calcutta.
B. Banerjee & Co., Calcutta.
The Indian School Supply Depôt, 309, Bow Bazar Street, Calcutta, and 226, Nawabpur, Dacca.
Butterworth & Co. (India), Ltd., Calcutta.
Rai M. C. Sarcar Bahadur and Sons, 90-2A, Harrison Road, Calcutta.
The Weldon Library, 57, Park Street, West, Calcutta.
Standard Literature Company Limited, Calcutta.
Lal Chand & Sons, Calcutta.
Higginbotham & Co., Madras.
V. Kalyanarama Iyer & Co., Madras.
G. A. Natesan & Co., Madras.
S. Murthy & Co., Madras.
Thompson & Co., Madras.
Temple & Co., Madras.
P. R. Rama Iyer & Co., Madras.
Vas & Co., Madras.
E. M. Gopalakrishna Kone, Madura.
Thacker & Co., Ltd., Bombay.
A. J. Combridge & Co., Bombay.
D. B. Taraporevala, Sons & Co., Bombay.
Mrs. Radhabai Atmaram Sagoon, Bombay.
Sunder Pandurang, Bombay.
Gopal Narayan & Co., Bombay.
Ram Chandra Govind & Son, Kalbadevi, Bombay.
The Standard Bookstall, Karachi.
Mangaldas Harkisandas, Surat.
Karsandas Narandas & Sons, Surat.
A. H. Wheeler & Co., Allahabad, Calcutta and Bombay.
N. B. Mathur, Supdt., Nazir Kanun Hind Press, Allahabad.
Rai Sahib M. Gulab Singh & Sons, Mufid-i-Am Press, Lahore and Allahabad.
Rama Krishna & Sons, Lahore.
Supdt., American Baptist Mission Press, Rangoon.
Manager, the "Hitavada," Nagpur.
S. C. Talukdar, Proprietor, Students and Co., Cooch Behar.
A. M. & J. Ferguson, Ceylon.
Manager, Educational Book Depôts, Nagpur and Jubbulpore.*
Manager of the Imperial Book Depôt, 63, Chandney Chauk Street, Delhi.*
Manager, "The Agra Medical Hall and Co-operative Association, Ltd." (Successors to A. John & Co., Agra).*
Supt., Basel Mission Book and Tract Depository, Mangalore.*
P. Varadachary & Co., Madras.*
H. Liddell, Printer, etc., 7, South Road, Allahabad.*
Ram Dayal Agarwala, 184, Katra, Allahabad.*
D. C. Anand & Sons, Peshawar.*
Manager, Newal Kishore Press, Lucknow.*

* Agents for the sale of Legislative Department Publications only.

NOTE:

It is regretted that it has been impossible to publish the evidence given before the Indian Cotton Committee earlier owing to the transfer of the Secretary to other duties in August, 1918. For convenience of reference, the evidence has been classified under the three heads, Agricultural, Irrigation and Commercial. Volumes I and II contain the Agricultural Evidence, Volume III the Irrigation Evidence and Volumes IV and V the Commercial Evidence. The evidence of a witness will, therefore, be found in one or other of these volumes according to its predominating character. The references in black type in the written statements are to the questions issued by the Committee which are printed at the commencement of each volume. Thus "**(30) Local trade customs**" shows that the paragraph is a reply to question 30. A glossary of the more common vernacular terms used in the evidence is appended.

F. NOYCE,
Secretary,
Indian Cotton Committee.

BOMBAY;
October 1st, 1919.

Glossary of the more common vernacular terms used in the evidence

Amin	Subordinate official of the Irrigation Department
Arat	Commission.
Aratya	Commission agent
Arhar	Pigeon pea (*Cajanus indicus*)
Bajra	Bulrush millet (*Pennisetum typhoideum*)
Bania	Village shop keeper and money lender
Barani	Land dependent on rainfall
Bhata	Laterite soil in the Central Provinces
Bhindi	Lady's finger (*Hibiscus esculentus*) a vegetable
Bhusa	Crushed straw
Bigha	A land measure usually about three eighths of an acre
Bora	Bag of unpressed cotton of varying weight generally five maunds
Chari	Great millet (*Sorghum vulgare*) grown as a fodder crop.
Chaudhri	A headman
Dalal	Broker
Deshi	Indigenous
Docra	Bag of unpressed cotton of varying weight generally five maunds
Ghats	Hills
Gwar gwara	Field vetch (*Cyamopsis psoraloides*) a fodder crop.
Hari	Cultivating tenant in Sind
Inam	Land held on favourable terms or free of land revenue
Juar	Great millet (*Sorghum vulgare*)
Kamdar	Fieldman subordinate in the Agricultural Department
Kan	Weight of lint obtained from unit weight of unginned cotton.
Kanungo	Subordinate revenue official in charge of a group of villages known as Revenue Inspector in Madras and Circle Inspector in Bombay
Kapas	Unginned cotton.
Karbi	Dry juar fodder
Karnam	Village accountant
Kharif	The autumn harvest
Khurpa	Hand hoe similar in shape to a trowel
Killa	Square of land usually equal to 1½ acre in area
Kodo kodon	A millet (*Paspalum scrobiculatum*)
Kumbu	Bulrush millet (*Pennisetum typhoideum*)
Kunbi	A cultivator
Kutki	A pulse (*Dolichos biflorus*)
Lakh	One hundred thousand
Mahajan	Money lender
Makki	Maize (*Zea mays*)
Malguzar	Landholder in the Central Provinces
Mandi	Market.
Methi	Fenugreek (*Trigonella foenum græcum*).
Moth	A pulse (*Phaseolus aconitifolius*)
Mukhtiarkar	Revenue officer in charge of a *taluka* (q v) in Sind
Mung	A pulse (*Phaseolus mungo*)
Patel	Village headman
Patwari	Village accountant
Phutties	Unginned cotton Kapas
Rabi	The spring harvest.
Rui	Lint.
Sahukar	Money lender
Sailab Sailabi	Land irrigated by floods or percolation from a river
San	Hemp (*Crotalaria juncea*)
Senj	A fodder crop (*Melilotus parviflora*)
Shaftal	A fodder crop (*Trifolium resupinatum*)
Tahsil	Revenue sub division of a district

Tahsildar . . . . Officer in charge of a *tahsil*, *taluk* or *taluka* (q.v.).

Taluk, taluka . . . . . . Revenue sub-division of a district.

Til . . . . Sesamum (*Sesamum indicum*).

Toria . . . . An oil seed (*Brassica campestris*).

Tur . . . . Pigeon pea (*Cajanus indicus*).

Urad . . . . A pulse (*Phaseolus mungo*).

Vamgu . . . . Bulrush millet (*Pennisetum typhoideum*).

Zaildar . . . . A rural notable appointed by Government. The head of a Zail or Circle of villages.

Zamindar . . . . A landowner; in the provinces visited by the Cotton Committee generally a peasant proprietor.

VOLUME I.

Agricultural.

PART I.

TABLE OF CONTENTS

V.—Punjab—*contd.*

VI.—Sind.

MINUTES OF EVIDENCE

TAKEN BEFORE THE

INDIAN COTTON COMMITTEE

VOLUME I—Agricultural.

PART I.

Questions issued by the Committee.

I.—Agricultural Experience

(a) "*Deshi*" *short staple cotton*

1. In what cotton growing districts have you been stationed and for what period in each? Have you been in actual touch with cotton cultivators?

2. What varieties of *deshi* short staple cotton are grown in the districts with which you are acquainted?

3. What is the average size of holdings in which cotton is grown and what proportion of the holding is under cotton?

4. [illegible] … cotton compare [illegible] … with which you are [illegible] … crease under *deshi* [illegible] … principles? Is seed selected for sowing specially hand ginned?

9. Please add any remarks you consider may be helpful to the Committee on the general economic state of the cotton growing districts with which you are acquainted.

N.B.—Please see note at end of Section (c) below.

(b) "*Deshi*" *long staple cotton.*

10. In what cotton growing districts have you been stationed and for what period in each? Have you been in actual touch with cotton cultivators?

11. What varieties of *deshi* long staple cotton are grown in the districts with which you are acquainted?

12. What is the average size of holdings in which cotton is grown and what proportion of the holding is under cotton?

13. What are the average yields and profits per acre of different varieties of *deshi* long staple cotton of which you have had experience? How do these compare with those of (a) *deshi* short staple cotton, (b) [illegible] … rotations, labour supply, etc.?

16. Do you consider that, in the cotton growing tracts with which you are acquainted, the right varieties of *deshi* long staple cotton are being pushed in the right districts or whether still superior types could be introduced?

[illegible] … with (i) [illegible] … les? Is [illegible] … of the cotton growing districts with which you are acquainted.

N.B.—Please see note at end of Section (c) below.

(c) *Exotic cotton.*

20. In what cotton growing districts have you been stationed and for what period in each? Have you been in actual touch with cotton cultivators?

21. What varieties of exotic cotton are grown in the districts with which you are acquainted?

22. What is the average size of holdings in which cotton is grown and what proportion of the holding is under cotton?

23. What are the average yields and profits per acre of the different varieties of exotic cotton of which you have experience ? How do these compare with those of (*a*) *deshi* short staple cotton, and (*b*) *deshi* long staple cotton, (*c*) other *deshi* crops ?

24. What rotations are followed and what manures, if any, are applied ?

25 What, in your opinion, are the special conditions which would affect any increase in the area under exotic cotton in the districts with which you are acquainted, *e.g.*, length of ginning season, irrigation available, climatic considerations, competition with food crops, limitation owing to necessity of observing rotations, labour supply, etc.?

26. Do you consider that, in the cotton growing tracts with which you are acquainted, the right varieties of exotic cotton are being pushed in the right districts or whether still superior types could be introduced ?

27. What measures would you recommend to prevent the mixing of exotic cotton with (*i*) *deshi* short staple cotton, (*ii*) *deshi* long staple cotton (*a*) in the field, (*b*) in the factory ?

28. What is your opinion as to the desirability of importing seed direct from America or Egypt as required as against relying on selected seed grown in India ?

29. Please add any remarks you consider may be helpful to the Committee on the economic state of the cotton growing districts with which you are acquainted ?

N.B.—The Committee would be obliged if you would give them your views as to the best organization for handling cotton in your province. Under this head you might consider research in connexion with improvement of the plant, establishment of seed farms for the production of improved seeds, district staff necessary and the regulation of buying agencies and ginning factories.

II.—COMMERCIAL ASPECT.

30. Give, as fully as possible, an account of local trade customs with which you are acquainted in regard to the marketing of the cotton crop, in particular as regards any systems of agency, advances, future buying or contracts.

31. What are the commercial names of the various grades of cotton with which you are acquainted and from what areas do they come ? Do you regard them as suitable and, if not, what alterations would you suggest ? Can you suggest any means by which the commercial names could be standardized, *i.e.*, of securing that the same name should be used for the same cotton from whatever locality it comes ?

32. What do you consider is the best form of buying agency ?

III.—STATISTICAL.

33. Do you consider that the cotton forecast, as at present published, is sufficiently accurate as far as your province is concerned ? If not, can you suggest any way in which it could be improved ?

34. Can you suggest any methods by which the statistical information published by Government in regard to cotton other than the forecasts, *e.g.*, the cotton press return, could be made of greater use to the cotton trade ?

35. What are your views in regard to the daily publication of Liverpool and Bombay cotton prices at up-country markets ?

IV.—MANUFACTURE.

(*a*) *Ginning and Pressing.*

36. What class of gins and presses do you use and how many have you in your factory ?

37. What is the size of the bale produced by your factory ?

38. What is your opinion as to the relative merits of saw and roller gins ?

39 Have saw gins been successful with Indian cottons and, if not, what is the objection to them ?

40. Have you experienced any difficulty in obtaining factory labour ?

41. Do you find the condition in which raw cotton reaches your factory in any way objectionable and, if so, what remedies would you suggest ?

42. Assuming that it were found possible to replace any large quantity of short staple cotton by long staple cotton, would any substantial alteration in your machinery be necessary ?

N.B.—The Committee would be obliged by any information you can give them in regard to the general question of long *versus* short staple cotton and also in regard to any experience you have had in handling any new staple cotton.

(*b*) *Spinning and Weaving.*

43. What counts are spun in your factory and what is your principal market ?

44. Do you find the condition in which cotton reaches your factory in any way objectionable and, if so, what remedies you suggest ?

45. What, in your opinion, would be the effect on the cotton market generally if any large proportion of the short staple cotton at present grown in India were replaced by long staple cotton ?

N.B.—The Committee would be obliged by any information you can give them inregard to the general question of long *versus* short staple cotton and also in regard to any experience you have had in handling new staple cotton.

V.—GENERAL.

46. Does your experience indicate that buyers in the past have been prepared to encourage the growth of improved cottons by offering a premium for them ?

47. Do you consider that the water rates charged have any effect on the cultivator's preference for a particular crop ?

48. Do you consider that any changes are called for in the schedule of water rates at present in force ?

49. Do you consider that the tenure on which land is held in the tracts of which you have experience in any way affects the extension of cultivation of cotton ?

VI.—IRRIGATION.

(*For Punjab witnesses only.*)

50. Please state what experience you have had of irrigation in general and in particular of irrigation under canals ? Have you any experience of canal irrigation assessment work ?

51 Has it been your experience that cultivators prefer wheat to cotton as an irrigated crop? If so, what is the reason for the preference?

52 (*a*) What is the critical period in regard to the water supply in the canals of which you have experience? How would this be affected if there were an increase in the irrigated area under cotton between April and October?

(*b*) When is cotton watered and what is the volume of water required per acre at each watering?

(*c*) Please furnish statistics for the channels of which you have had experience showing—

53 (*a*) Are there any periods during which the supply in the rivers would be sufficient for a large expansion of the area under cotton to utilize which the canals could properly be enlarged with due regard to financial considerations? If so please give figures for the canals of which you have experience?

(*b*) How would such an enlargement of the canals affect the area under wheat?

54 (*a*) To what extent could the duty of water on the canals of which you have experience be improved *by equalising the distribution of the supply between the upper and lower outlets on the distributaries?*

N.B.—In the Punjab this process is technically known as the remodelling of outlets

(*b*) To what extent could modules be used to effect this purpose?

(*c*) If the distribution were equalized what additional irrigated area would accrue? What crops would be grown on this additional area?

case of American cotton?

begin to appear which is between July 20th and August 10th and [the

(*b*) To what extent do wells exist in the areas commanded by the canals of which you have experience and what steps are required to extend the irrigation under them in those areas?

(*c*) Have you any experience of tube wells and do you consider that their use would be valuable in this connexion?

(*d*) Do you consider that it would be possible sufficiently to improve the canal system by the construction of weirs or in other ways so as to obviate the use of wells?

(*e*) Can you give an idea of the cost of such an improvement in the canals and the time it would take to carry out as compared with the cost of the construction of the requisite number of wells and time it would take?

57 In case it were found possible to increase the size of canals and consequently the irrigated area under cotton, what addition to gross revenue at present rates for water would you expect? Please illustrate your reply from the statistics furnished in answer to other questions

this head?

64 Do you consider that the water rates charged have any effect on the cultivator's preference for a particular crop? Do you consider that any changes are called for in the schedule of water rates?

VI.—Irrigation

(For witnesses from Provinces other than the Punjab and North West Frontier Province.)

65 Please state what experience you have had of irrigation in general and in particular of irrigation under canals. Have you any experience of canal irrigation assessment work?

66 When is cotton watered and what is the volume of water required per acre at each watering?

67 Has it been your experience that cultivators prefer wheat to cotton as an irrigated crop? If so, what is the reason for the preference?

... gradually in autumn or are

tivator's preference

our reply from the

69. (*a*) To what extent do wells exist in the areas commanded by the canals of which you have experience and what steps are required to extend the irrigation under them in those areas?

(*b*) Have you any experience of tube wells and do you consider that their use would be valuable in this connexion?

70. Do you consider the existing water rates charged for cotton suitable? If you can give statistics to explain your answer, please do so.

71. Can you give a rough estimate of the average area of each crop grown on a holding of 100 acres? How are these areas affected by the water supply, the necessity for growing a fodder crop and of preserving suitable rotations of crops. Would any proposals you have put forward bring about an alteration in these areas?

72. Do you consider that sufficient water is available for a considerable increase in the area of cotton and, if so, why is a larger area not irrigated?

73. Is it your experience that cultivators prefer *deshi* cotton to American cotton? If so, can you explain their reasons for the preference?

74. Is it your experience that the canal regulations create any difficulties in regard to the irrigation of American cotton?

I.—United Provinces.

The Hon'ble Mr. H. R. C. HAILEY, C.I.E., I.C.S., Director of Land Records and Agriculture, United Provinces.

EXAMINED AT CAWNPORE, NOVEMBER 1ST, 1917.

Written statement.

1. (*General.*) The cotton growing area of the provinces is practically limited to the western districts that is, to the tract lying between the Jumna and Ganges, the Ganges and the Ramganga with Bundelkhand, comprising the Meerut, Agra, Allahabad and Jhansi divisions with parts of Rohilkhand. It is true that a certain amount of cotton is grown in the border districts such as Unao and Hardoi, but the total area in Oudh is small and the submontane and eastern districts are generally unsuitable for cotton growing. The normal cultivated area of the cotton growing western districts is 16,516,000 acres; that of the submontane and eastern 18,390,000. The water level in the latter is for the most part near the surface, and the rainfall is heavier in these than in the western districts; though attempts have been made to grow cotton in these parts of the provinces, they have for the most part ended in failure, owing to the ground readily becoming water-logged. It is unlikely in any case that cotton would supersede rice and sugarcane.

(2) The largest area on record under cotton was that of 1913-14 when 15½ *lakhs* of acres were under this crop. Prices had been high in the previous year, the season was a dry one and the conditions generally were favourable for a large area under cotton. This area is only likely to be much improved upon by a large increase in cotton growing in Bundelkhand where, provided water for early sowing were available, there might be a considerable increase in the lighter soils. In the heavier or black soils, no appreciable increase is to be looked for. The area under cotton is largely determined by two factors (1) current prices, and (2) the character of the season. In these provinces, the cultivator has a wide variety of crops to choose from and a drop in the prices of cotton will tempt him to put down another crop. In 1915-16, after the heavy fall of prices in the previous year, the area dropped to eight *lakhs* of acres. In the following year, namely 1916-17, prices improved, but indigo had come into competition and this crop was sown on a considerable scale in fields that had hitherto been devoted to cotton. In what is known as the Upper Doab cotton competes with sugarcane and a rise in the price of *gur* will lead to a decline in the area under cotton. The Middle Doab is unsuitable for cane and, under normal conditions, cotton will remain the favourite *kharif* crop in this tract. There have been heavy fluctuations in the area under cotton in Bundelkhand and at one time it became unpopular owing to series of bad years, but, prior to the war, cultivation was showing a somewhat marked improvement. Perhaps, however, the main factor influencing the area under cotton is the character of the rains. If the rains are late, the cultivator will prefer to sow a food grain crop such as *bajra*, as it is improbable that cotton will mature before the cold weather sets in. This is shown by the drop in area in 1911-12. Prices were good in the previous year but there was a drop in cultivation from 13½ *lakhs* of acres to nine *lakhs* owing to the lateness of the monsoon. This is the factor that very largely affects the area in districts which either have no canal irrigation or where, as in Bundelkhand, water cannot be regularly provided for hot weather cultivation.

(3) Of recent years, every effort has been made to induce the cultivators to sow their cotton early with the aid of canal irrigation in order to render the crop independent of the rainfall. The irrigated area under cotton varies considerably; the largest of which there is any record was in 1913-14, when 6½ *lakhs* were sown with the aid of irrigation. In the year 1916-17, the area had fallen as low as two *lakhs* since the cultivators, being uncertain of prices, did not consider it worth while to pay irrigation rates, and trusted to sowing on the monsoon. On an average about a third of the crop is sown with canal irrigation, but in dry years when the monsoon is late, as in 1911-12, the proportion is considerably higher and in that year was 45 per cent. This point of considerable importance, since the long staple cotton which has hitherto been grown in the provinces, namely Cawnpore American, must be sown early with the aid of irrigation. It must also be pointed out that in these provinces there are no large tracts wholly commanded by canal irrigation. It is the exception rather than the rule for the whole of the village to be commanded by the canal and consequently, unless a long staple cotton is introduced that can be sown on the rains, it may happen that short staple and long staple cotton are grown in the same village with the attendant inconveniences and dangers of mixing of seed.

I.—AGRICULTURAL EXPERIENCE.

(*a*) "*Deshi*" short staple cotton.

2. (2) **Varieties.**—The short staple *deshi* grown in these provinces is that known to the trade as Bengals. The length of the staple may be said to range from ½ to ⅝ths of an inch. Certain areas within the provinces

have a reputation for a better class of cotton, as, for instance, the cotton grown round Chandausi in the Moradabad district which usually fetches a higher price than ordinary *deshi*, and that grown round Kashipore in the Naini Tal district has a sufficiently good reputation to attract imports from other localities in order to secure the price that is being fetched for the locally grown cotton. These differences seem due to local con- [illegible]

[illegible]

be taken for what it is worth.

List.

	Rs	A	P.
Ploughing	4	0	0
Clod Crushing	0	8	0
Seed	0	6	0
Sowing	0	13	0
Weeding twice	4	0	0
Picking	5	0	0
Rent	10	0	0
Irrigation rate, if irrigated	2	0	0
TOTAL	26	11	0

It must, however, be pointed out that some of these operations such as ploughing, picking, etc., are carried [illegible]

mechanical power in the well irrigated tracts. The exact area of cotton irrigated by this means is not known, but every agricultural officer has had instances before him of cotton crops raised by this means; though cotton is occasionally sown from wells dependent on bullock lift, the strain is too much for the cattle and the amount of water required for preliminary watering in the hot weather is very great.

8. (8) **Uses of seed.**—The seed of these provinces, owing to the ravages of the pink boll-worm, has a bad reputation and I am assured by Messrs. Ralli Brothers that not a great deal of it is exported to England. It is only necessary to look at the seed in any ginning factory to see the damage done by this pest. For the most part, the seed is fed to cattle or exported to the Punjab. Taking the figures of the year ending March 1914, the total export from these provinces amounted to 19½ *lakhs* of maunds of which eighteen went to Punjab and 1½ to Central India. Only 5,000 maunds went to Bombay, 1,000 to Karachi and the same amount to Calcutta. This fully bears out the statement made as to the unpopularity of the seed produced in these provinces for export. I think it may be attributed largely to the boll-worm damage though possibly the seed was not so rich in oil as that grown in Bombay Presidency. There is too the further question of railway freight.

9. (9) **General economic conditions.**—I will only remark under this head that in the canal districts the cultivators follow cotton, wherever possible, with a catch crop, usually peas, or peas and barley mixed. They therefore greatly prefer an early cotton, the pickings from which may be finished in time to enable them to sow the *rabi* crop. The earlier it is off the ground, the better the class of crop which can be sown. This is an impediment to the spread of a cotton of the American type which goes on yielding until the frost sets in. As regards cotton growing generally, I think it might be useful for the Committee if I append some figures* showing the rainfall in the Aligarh and Cawnpore districts from June to September in the years 1914-15 and 1915-16. It will be seen that for the last two years, namely 1915 and 1916, the rainfall in August and September has been extremely heavy, and I may add that the rainfall in September in this year was the heaviest of which there seems to be any record. Under these circumstances, it will be understood how excessively precarious cotton growing in these provinces must be. The three years, 1915, 1916 and 1917, have been extremely poor for cotton growing and there is little doubt that, if indigo shows any signs of becoming a permanency in these provinces, many cultivators would take to it in preference to cotton simply because of the assured return. These figures have another bearing, namely, that the crop being subject to such extreme fluctuations, the cultivator, who is usually without capital, will always prefer the hardiest type known to him and one most likely to stand the extreme vicissitudes of the climatic conditions to which it is exposed. It can hardly be expected that a good quality cotton can be found to be quite so hardy in character and resistent to extremities of great heat and heavy rain as that which has become popular in the western districts, *viz.*, the Aligarh White Flowered, the staple of which is short and the lint harsh. This cotton of course has suffered with other cottons during the last three years, but, at the same time, its popularity is undoubted and this may be attributed not merely to its high ginning percentage but also to the belief of the cultivators that they get a better yield from it in bad seasons than from a better quality cotton. The extreme vicissitudes, to which these provinces are exposed, do not mark them out as an ideal cotton growing tract and the cultivators' apprehensions of the future of his crop do, to my mind, largely explain the reluctance to embark on growing a cotton possessing a longer staple. Price is, of course, a consideration and this weighs particularly in any comparison between the respective advantages to the grower of American cotton and Aligarh White Flowered which has always commanded a premium. But as between ordinary *deshi* and American, the advantage has, owing to the arrangements made by the Department, been in favour of the latter, and its comparatively slow expansion is due mainly to a succession of bad seasons and the unwillingness of the cultivator to try a new kind of cotton which he believes is likely to suffer more severely from climatic conditions than the indigenous variety.

(*b*) "*Deshi*" *long staple cotton.*

10. (11) **Varieties.**—The only *deshi* long staple cotton is the hybrid which Mr. Leake had produced and of which he will give a description.

(*c*) *Exotic cotton.*

11. (*Historical.*) Mr. Burt will give details regarding the present state of growing of American cotton round Cawnpore, but it would be as well if I gave the short history of the introduction of long staple cotton into these provinces, particularly with a view to making it clear why the present locality which is perhaps not the best suited for a long staple cotton came to be selected.

(2) After a variety of experiments dating from 1881 at the Cawnpore farm, a long staple cotton of mixed American origin known as Cawnpore American was put in the Aligarh district in 1906. In order to overcome the difficulties of marketing small quantities, and to secure a pure supply of seed, the *kapas* was bought back from the cultivators at Rs. 2 per maund over the price of *deshi kapas*. At the time the price of *deshi* was as low as Rs. 6 per maund of *kapas*. The lint was ginned by the Department and sold by public auction, the price realised being sufficient to cover the expenses. This arrangement continued for the three seasons, 1906, 1907 and 1908. In the latter year, the area had increased considerably and an advance of Rs. 45,000 was required to finance the crop. The Accountant-General objected to the large amount of this advance without previous sanction of the Government of India. In reply, the Government of India expressed the hope that arrangements would be made to discontinue the intervention of the Department as soon as possible. It is understood that this action was taken in accordance with orders issued by the Secretary of State on the subject of interference with private trading. By some mistake, these orders were not communicated in time to Dr. Parr, the Deputy Director. The cotton was brought in as before by the cultivators who expected the same premium. This Dr. Parr was not authorised to give and as the cultivators could not wait they took it off to the bazaar where they actually got lower prices than *deshi*—since, in the bazaar, *kapas* is sold on the basis of its ginning percentage. Eventually some arrangements were made to clear off the balance, but not at the price that was understood would be given and after much had been sold privately. The cultivators were aggrieved and next year there was a very heavy drop in the area of cultivation. When it was decided to start growing long staple cotton again, it was thought better to open operations in the Lower Doab where there had been no difficulties in the marketing and where no prejudice against it existed. This is the main area in which American cotton is grown though a smaller area is still grown in the Upper Doab. A further reason for the growing of long staple cotton round Cawnpore was that some of the Cawnpore cotton

* *Vide* Annexure, page 9.

	Rs A P	Rs A P
1913	1 8 0	
1914	1 4 0	to 1 8 0
1915	1 12 0	, 2 0 0
1916	1 0 0	

In the latter year, the price of *deshi* was very high Through all these years the Department has made

that water will be forthcoming in the sowing season As regards climatic considerations, it has been proved that in normal seasons Cawnpore American is at least as heavy a yielder as *deshi* and potentially a higher yielder with proper cultivation Whether or not it really does—as the cultivators seem to think—suffer more in wet years than *deshi* it is impossible to say but it is somewhat more expensive to grow as it always requires canal irrigation and somewhat better cultivation and looking to the precariousness of the crop in these provinces there is justification for the pre

gradual expansion round certain centres

II.—*Commercial Aspect*

who may be a local dealer or a *zamindar* or an occupancy tenant who buys in other cultivators' cotton and

differ greatly in these Provinces from those in other parts of India The dealer who brings in cotton from

the adjoining villages conducts his operations through the medium of the *aratya*. The latter, in theory, secures him the best price available in the market, taking a fixed commission and making certain charges for weighment and generally also a small charge for what is known as *ramlila*. The market price for the day which is known as "*mir*" is fixed by the big dealers who are in communication with Bombay. In the actual bargaining, a number of considerations such as the amount of discoloured cotton, the ginning percentage, amount of dirt, brightness of colour and fraudulent practices, such as watering, have to be taken into account. The Bombay prices which are for lint only can at best form a very general guide in buying and selling *kapas*. In conducting these transactions the much abused *aratya* does perform some useful services to the seller. He is the medium of communication with the larger buyers who do not want to deal in small lots and further he pays the money down on the spot. The dealer himself is by no means without experience nor he is so much at the mercy of the *aratya* as is sometimes represented. He has a very good notion of what local prices should be and of the value of his cotton and probably generally manages to secure a fair price. In these Provinces, cotton forms only one of a great variety of other crops and there are no regular cotton markets. The *aratya* has his shop and frequently the shops of others may be close together for convenience. In the absence of any regular market it is an advantage to the dealer to go straight to one of these *aratya's* shops. It would certainly be to the benefit of dealers generally, if regular cotton markets were established but, except in a few centres, it is doubtful whether the importance of this crop would warrant it. Our cotton season is a short one and for the last two years it may be doubted whether the total yield has been as much as three *lakhs* of bales. The advantage of the cultivator can be better secured by some method of joint sale than by any alteration in the actual customs in vogue in the market.

III.—Statistical.

15. (33) **Improvement of cotton forecast.**—Since the system of returns from baling presses has been established, it has been possible to make a further test of the accuracy or otherwise of the cotton forecast. The following figures compare the results of the last two years.

List.

	Estimated outturn in Bales.	Ginned amount in Bales.
1915	* 261,873	† 235,815
1916	* 309,805	† 245,136

* Includes outturn for the Rampur State.

† These figures are for the year from 1st September to 31st August.

It is believed that the returns are received from practically all the baling presses at work and, in the principal centres, they are visited by a member of Agricultural Department who enquires whether the returns have been submitted. A certain quantity of the cotton grown is kept for domestic use and the better class of cultivators themselves gin enough for seed purposes. The forecast is therefore necessarily in excess of the figures received from ginning presses and some of the mills take in loose cotton which has not been baled. The published returns give rise to some misapprehension as they contain a column showing number of baling presses in the United Provinces and another column for the returns that have been received. This has misled some of the manufacturers into thinking that the returns are received only for a small proportion of those that work, whereas, in point of fact, at the larger centres the presses are formed into pools and in years in which the season has been unfavourable only a limited number will be working. Considering the difficulties of framing the forecast, I consider that a reasonable amount of accuracy has been secured. It would however greatly assist matters if baling presses were compelled by legislation to submit their returns. At present we are entirely dependent on their good will which is a very unsatisfactory system. There does not appear to be any reason why presses should not be compelled by law to state their fortnightly outturns on the condition that the figures of individual presses were not published.

VI.—Irrigation.

16. (*General.*) As regards head VI, it may be understood that the existing water rates for cotton, *viz.*, Rs. 2 are relatively low considering the profits obtainable in good years in the crop. There is no doubt that these low rates have greatly encouraged the sowing of early cotton. So far as these Provinces are concerned, I have only to remark that it would be a great advantage if adequate arrangements could be made for providing water for early sowing of cotton in Bundelkhand. As regards long staple cotton, the future of the cotton in these Provinces largely depends on the canals being able to ensure a supply of water regularly to the grower. There is very little doubt that the Irrigation Department have not enough water for any considerable extension of the cotton area; but more important than this is the necessity for giving an absolute assurance to the grower that he will get water in time for sowing the American cotton and will receive water for a second watering provided the rains are unusually late. As regards other forms of irrigation it must be pointed out that the tube wells can never supply water as cheaply as canals; even when water is pumped direct from existing wells, the cost will always be higher than that of irrigation from canals. I do not therefore look to any great expansion of the cotton growing area from the use of any mechanical power, though undoubtedly when plant is again available a much larger number of engines will be put down and there may be some expansion of cotton area resulting from it. An experience gained this year may be of some value in connection with this. The cultivators round the tube well were offered water at the bare cost of running if they would sow cotton in the hot weather. They almost unanimously preferred to wait till the rains rather than take the rate which was about double the canal rate.

ANNEXURE

Statement showing the rainfall in the Aligarh and Cawnpore districts from June to September in the years 1914 1915 and 1916

MONTHS	1914				1915				1916				REMARKS
	CAWNPORE		ALIGARH		CAWNPORE		ALIGARH		CAWNPORE		ALIGARH		
	Actual.	Normal.	Actual.	Normal.	Actual	Normal	Actual	Normal.	Actual	Normal	Actual	Normal	
June	1 32	3 56	2 14	2 43	2 45	3 56	0 94	2 43	9 [illegible]	3 55	2 90	[illegible] 43	
July	10 65	9 98	7 17	8 12	8 11	9 98	3 90	8 12	11 65	10 01	9 11	8 12	
August	9 27	10 20	8 [illegible]3	7 81	16 21	10 [illegible]0	4 10	7 81	13 [illegible]6	10 14	9 30	[illegible] 81	
September	5 61	5 21	7 90	3 99	12 53	5 [illegible]1	2 43	3 83	6 39	5 21	6 27	3 99	
TOTAL	[illegible]5 83	28 95	25 44	22 35	38 30	28 95	11 37	22 35	40 98	28 91	27 [illegible]8	22 35	

the adjoining villages conducts his operations through the medium of the *aralya*. The latter, in theory, secures him the best price available in the market, taking a fixed commission and making certain charges for weighment and generally also a small charge for what is known as *ramlila*. The market price for the day which is known as "*mir*" is fixed by the big dealers who are in communication with Bombay. In the actual bargaining, a number of considerations such as the amount of discoloured cotton, the ginning percentage, amount of dirt, brightness of colour and fraudulent practices, such as watering, have to be taken into account. The Bombay prices which are for lint only can at best form a very general guide in buying and selling *kapas*. In conducting these transactions the much abused *aralya* does perform some useful services to the seller. He is the medium of communication with the larger buyers who do not want to deal in small lots and further he pays the money down on the spot. The dealer himself is by no means without experience nor he is so much at the mercy of the *aralya* as is sometimes represented. He has a very good notion of what local prices should be and of the value of his cotton and probably generally manages to secure a fair price. In these Provinces, cotton forms only one of a great variety of other crops and there are no regular cotton markets. The *aralya* has his shop and frequently the shops of others may be close together for convenience. In the absence of any regular market it is an advantage to the dealer to go straight to one of these *aralya's* shops. It would certainly be to the benefit of dealers generally, if regular cotton markets were established but, except in a few centres, it is doubtful whether the importance of this crop would warrant it. Our cotton season is a short one and for the last two years it may be doubted whether the total yield has been as much as three *lakhs* of bales. The advantage of the cultivator can be better secured by some method of joint sale than by any alteration in the actual customs in vogue in the market.

III.—STATISTICAL.

15. (33) **Improvement of cotton forecast.**—Since the system of returns from baling presses has been established, it has been possible to make a further test of the accuracy or otherwise of the cotton forecast. The following figures compare the results of the last two years.

List.

	Estimated outturn in Bales.	Ginned amount in Bales.
1915	* 261,873	† 235,845
1916	* 308,805	† 245,136

* Includes outturn for the Rampur State.

† These figures are for the year from 1st September to 31st August.

It is believed that the returns are received from practically all the baling presses at work and, in the principal centres, they are visited by a member of Agricultural Department who enquires whether the returns have been submitted. A certain quantity of the cotton grown is kept for domestic use and the better class of cultivators themselves gin enough for seed purposes. The forecast is therefore necessarily in excess of the figures received from ginning presses and some of the mills take in loose cotton which has not been baled. The published returns give rise to some misapprehension as they contain a column showing number of baling presses in the United Provinces and another column for the returns that have been received. This has misled some of the manufacturers into thinking that the returns are received only for a small proportion of those that work, whereas, in point of fact, at the larger centres the presses are formed into pools and in years in which the season has been unfavourable only a limited number will be working. Considering the difficultier of framing the forecast, I consider that a reasonable amount of accuracy has been secured. It would howevet greatly assist matters if baling presses were compelled by legislation to submit their returns. At presens we are entirely dependent on their good will which is a very unsatisfactory system. There does not appear to be any reason why presses should not be compelled by law to state their fortnightly outturns on the condition that the figures of individual presses were not published.

VI.—IRRIGATION.

16. (*General.*) As regards head VI, it may be understood that the existing water rates for cotton, *viz.*, Rs. 2 are relatively low considering the profits obtainable in good years in the crop. There is no doubt that these low rates have greatly encouraged the sowing of early cotton. So far as these Provinces are concerned, I have only to remark that it would be a great advantage if adequate arrangements could be made for providing water for early sowing of cotton in Bundelkhand. As regards long staple cotton, the future of the cotton in these Provinces largely depends on the canals being able to ensure a supply of water regularly to the grower. There is very little doubt that the Irrigation Department have not enough water for any considerable extension of the cotton area ; but more important than this is the necessity for giving an absolute assurance to the grower that he will get water in time for sowing the American cotton and will receive water for a second watering provided the rains are unusually late. As regards other forms of irrigation it must be pointed out that the tube wells can never supply water as cheaply as canals ; even when water is pumped direct from existing wells, the cost will always be higher than that of irrigation from canals. I do not therefore look to any great expansion of the cotton growing area from the use of any mechanical power, though undoubtedly when plant is again available a much larger number of engines will be put down and there may be some expansion of cotton area resulting from it. An experience gained this year may be of some value in connection with this. The cultivators round the tube well were offered water at the bare cost of running if they would sow cotton in the hot weather. They almost unanimously preferred to wait till the rains rather than take the rate which was about double the canal rate.

ANNEXURE

Statement showing the rainfall in the Aligarh and Cawnpore districts from June to September in the years 1914, 1915 and 1916

Months	1914				1915				1916				Remarks
	Cawnpore		Aligarh		Cawnpore		Aligarh		Cawnpore		Aligarh		
	Actual						Actual	Normal	Actual	Normal	Actual	Normal	
						3 [illegible]6	0 94	2 43	9 [illegible]	3 [illegible]	[illegible] 90	[illegible] 43	
										1	9 11	8 12	
										10 14	9 [illegible]0	[illegible] 81	
											6 2[illegible]	3 99	
										[illegible]8 91	27 [illegible]8	2[illegible] 3[illegible]	

the adjoining villages conducts his operations through the medium of the *aratya*. The latter, in theory, secures him the best price available in the market, taking a fixed commission and making certain charges for weighment and generally also a small charge for what is known as *ramlila*. The market price for the day which is known as "*mir*" is fixed by the big dealers who are in communication with Bombay. In the actual bargaining, a number of considerations such as the amount of discoloured cotton, the ginning percentage, amount of dirt, brightness of colour and fraudulent practices, such as watering, have to be taken into account. The Bombay prices which are for lint only can at best form a very general guide in buying and selling *kapas*. In conducting these transactions the much abused *aratya* does perform some useful services to the seller. He is the medium of communication with the larger buyers who do not want to deal in small lots and further he pays the money down on the spot. The dealer himself is by no means without experience nor he is so much at the mercy of the *aratya* as is sometimes represented. He has a very good notion of what local prices should be and of the value of his cotton and probably generally manages to secure a fair price. In these Provinces, cotton forms only one of a great variety of other crops and there are no regular cotton markets. The *aratya* has his shop and frequently the shops of others may be close together for convenience. In the absence of any regular market it is an advantage to the dealer to go straight to one of these *aratya's* shops. It would certainly be to the benefit of dealers generally, if regular cotton markets were established but, except in a few centres, it is doubtful whether the importance of this crop would warrant it. Our cotton season is a short one and for the last two years it may be doubted whether the total yield has been as much as three *lakhs* of bales. The advantage of the cultivator can be better secured by some method of joint sale than by any alteration in the actual customs in vogue in the market.

III.—Statistical.

15. (33) **Improvement of cotton forecast.**—Since the system of returns from baling presses has been established, it has been possible to make a further test of the accuracy or otherwise of the cotton forecast. The following figures compare the results of the last two years.

List.

	Estimated outturn in Bales.	Ginned amount in Bales.
1915	* 261,873	† 235,845
1916	* 308,805	† 245,136

* Includes outturn for the Rampur State.

† These figures are for the year from 1st September to 31st August.

It is believed that the returns are received from practically all the baling presses at work and, in the principal centres, they are visited by a member of Agricultural Department who enquires whether the returns have been submitted. A certain quantity of the cotton grown is kept for domestic use and the better class of cultivators themselves gin enough for seed purposes. The forecast is therefore necessarily in excess of the figures received from ginning presses and some of the mills take in loose cotton which has not been baled. The published returns give rise to some misapprehension as they contain a column showing number of baling presses in the United Provinces and another column for the returns that have been received. This has misled some of the manufacturers into thinking that the returns are received only for a small proportion of those that work, whereas, in point of fact, at the larger centres the presses are formed into pools and in years in which the season has been unfavourable only a limited number will be working. Considering the difficulties of framing the forecast, I consider that [illegible] accuracy has been secured. It would however greatly assist matters if baling presses [illegible] legislation to submit their returns. At present we are entirely dependent on their good will which is a very unsatisfactory system. There does not appear to be any reason why presses should not be compelled by law to state their fortnightly outturns on the condition that the figures of individual presses were not published.

VI.—Irrigation.

16. (*General.*) As regards head VI, it may be understood that the existing water rates for cotton, *viz.*, Rs. 2 are relatively low considering the profits obtainable in good years in the crop. There is no doubt that these low rates have greatly encouraged the sowing of early cotton. So far as these Provinces are concerned, I have only to remark that it would be a great advantage if adequate arrangements could be made for providing water for early sowing of cotton in Bundelkhand. As regards long staple cotton, the future of the cotton in these Provinces largely depends on the canals being able to ensure a supply of water regularly to the grower. There is very little doubt that the Irrigation Department have not enough water for any considerable extension of the cotton area ; but more important than this is the necessity for giving an absolute assurance to the grower that he will get water in time for sowing the American cotton and will receive water for a second watering provided the rains are unusually late. As regards other forms of irrigation it must be pointed out that the tube wells can never supply water as cheaply as canals ; even when water is pumped direct from existing wells, the cost will always be higher than that of irrigation from canals. I do not therefore look to any great expansion of the cotton growing area from the use of any mechanical power, though undoubtedly when plant is again available a much larger number of engines will be put down and there may be some expansion of cotton area resulting from it. An experience gained this year may be of some value in connection with this. The cultivators round the tube well were offered water at the bare cost of running if they would sow cotton in the hot weather. They almost unanimously preferred to wait till the rains rather than take the rate which was about double the canal rate.

kapas on our farms whereas in a favourable year twelve or thirteen maunds may be counted on I do not think the publication of Bombay prices in the village *mandis* will greatly benefit the cultivator and I do not see any reason for going out of our way to assist the middlemen I do not therefore consider that the publication of prices would do much to ensure the grower getting a better price for his cotton I consider that the submission of ginning and baling returns should be made compulsory At present it is extremely difficult to get these returns submitted and we have to send men round the factories and press them to submit their returns If ginning factories are licensed this should be made a condition

27 The Imperial Cotton Specialist is so far as I am aware of no assistance to the United Provinces

latter deals directly with the tenants and the decision as to whether the cotton will prove popular must rest ultimately with the Deputy Director He will not go in for cotton if he finds that for particular reasons it is not popular with the growers If possible the botanist's farm should be near the head quarters but this is not easy to arrange Seed farms should be in the hands of the Deputy Directors and the distribution of seed must rest with them This does not exclude the Economic Botanist from maintaining a farm to

provinces which seems to me quite uncalled for as it would only be a half time business K 22 does not necessarily conflict with Cawnpore American because it can be grown on unirrigated land The variety it would displace would be Aligarh White Flowered An Entomologist is badly needed in these provinces as the ravages by boll worm are serious and a recommendation to this effect by the Committee would be very welcome

28 (*Mr Walia*) The price of *desi* fluctuates greatly and only averages over the season can be given The figure I quoted differs from that given by Rai Ganga Prasad which has possibly worked out on different data The price of *bur* cotton is much the same as Cawnpore American The habit of Cawnpore American is better than that of *bur* and so far as my experience goes it yields better and is not so late

29 The cultivator is in the habit of watering his cotton and so does the middleman when bringing it into the market The brokers however are fully alive to this custom and discount it I do not think that

the crop

31 (*President*) There are I believe clauses in the pool agreement ruling out the erection of new ginneries or their financing by members of the pool It would be only reasonable to refuse licences for new factories in places where a sufficient number exist already I do not think you could compel a man to remove

The Hon'ble Mr. H. R. C. Hailey, C.I.E., I.C.S. called and examined.

17. (*Mr. Henderson.*) The principal recommendation of Aligarh White Flowered is that it has a high ginning percentage, namely from about 39 to 42. As to yield, it is very difficult to say anything about the average yield of the cotton crop in these provinces where conditions are so variable. All that can be said is that it has a reputation of being a heavy yielder and in this respect is possibly superior to ordinary *deshi*. It at present extends over an area of from a *lakh* to a *lakh* and a half of acres. The premium in its favour was originally Re. 1 per maund of *kapas*, but now it is not more than eight annas. There is no difference in the price of its lint and that of *deshi*. The spinners object to this cotton but buyers who buy *kapas* mainly on ginning percentage do not discriminate against it on account of its poor spinning quality. It is quite possible, however, that the spinners may object to it as they are already complaining about the difficulty of spinning it. When it was taken for the Continent or Japan, I believe it was largely used for unions or for mixing with waste.

18. It would be correct to say that there are four main classes of cotton in these provinces, *viz.*, Aligarh White Flowered, ordinary *deshi*, *[illegible]* and Cawnpore American. It is very hard to work out any correlation between prices of *deshi* and American cotton. The price of *deshi* sometimes goes up out of all proportion to that of American. The price of the American cotton quoted in Liverpool naturally affects the price of the American cotton grown here but if *deshi* happens to be a short crop, then its price goes up out of proportion to American because it has an entirely separate market. The cultivator prefers growing *deshi* cotton because it is easier to grow.

19. I have not seen 4 F. and have no experience of the methods adopted in the Punjab. I consider it absolutely essential that the Agricultural Department in the United Provinces should control the ginning and distribution of seed of its recommended types of cotton. I think it would be advisable to introduce auctions of lint. If the *kapas* were auctioned, it would be impossible to maintain the purity in seed which would get mixed at once. At present the Agricultural Department hires a ginning factory. It would be possible to hold auctions of lint, if the Agricultural Department collected the *kapas* and sold the cotton by auction. Even if the crop greatly increased, this could still be carried out provided we had sufficient staff because we could always hire additional ginning factories. Under present conditions, I do regard it as most essential that the Agricultural Department should control ginning of American cotton. The expansion of this cotton in United Provinces is limited to the irrigated area. This amounts in all to some 6½ *lakhs* of acres, that is to say, this is the maximum area that has been under irrigated cotton in these provinces.

20. K. 22 was only issued two years ago, and both of these were very wet years. It is not possible to say anything definite about it. At the Aligarh farm, it did not give as good a yield as White Flowered. There is not the same objection to it as to American on the score of lateness. The mills are willing to pay a premium over *deshi* for it All that can be said is that at present it is [illegible] that another cotton of Mr. Leake's *viz.* K. 28, may prove a considerable impro[illegible]w on the unirrigated tracts whereas American would not.

21. It is difficult to get the cultivator's view regarding American cotton. 1913-14 was a good year for cotton and the cultivator got heavy profits from his American cotton crop. It looked as though it was going ahead very fast. Bad years followed and it has gone back. Its yield is higher than that of *deshi* by general agreement. The cultivator prefers a cotton of the *deshi* type because he can sow a catch crop afterwards in the *rabi.* If, however, a really heavy premium were obtainable for the American, this objection to it would disappear. I think that if we got one really good year and a substantial premium, the crop would go ahead fast and the cultivator would not bother very much about the catch crop. He can in any case sow peas after it. Sowing in lines is not very common in these provinces, but cotton is grown very much as a mixed crop.

22. (*Mr. Roberts.*) With regard to the premium given for the Cawnpore American, our object has been to see that the cultivator got at least Re. 1 per maund of *kapas*. This is not the market rate but a rate entered into with the Cawnpore mills in order to insure at least some premium. It would be difficult to guarantee a premium based on the difference between the rates for *deshi* cotton and the rates for American cotton in Bombay. The guarantee has to be given at sowing time and the cultivator wants something definite. I agree that the present arrangement is not altogether satisfactory but the area under American is so far small and it is more desirable to get a definite fixed advantage over *deshi* than the full possible difference in price at harvesting. This year advances have been received from Government to enable me to pay Re. 1 premium and then institute auctions in Cawnpore. If Cawnpore will not take the cotton or all of it, then Bombay will be tried. The cotton will be sold after ginning at our factory.

23. According to figures of yield, the yield of cotton is higher in these provinces than in the Punjab. These figures of outturn are based on experimental crop cuttings and experiments at the farms. The figure is steadily rising. They are low for anything like a good year. In case of cotton, there is a good deal to go on because our forecasts can be compared with the figures of imports and exports and also with the returns from ginning factories. On the whole, our accepted figures would appear to be low rather than high.

24. The United Provinces cannot be said to be an ideal tract for cotton owing to the extraordinary variations of climate. The two best districts are possibly Aligarh and Muttra. These are in the Western Circle, which was under Dr. Parr. He was keener on *buri* than Cawnpore American because the ginning percentage of the former was somewhat higher. Some of the mills too seemed to prefer *buri* to [illegible]rican. Different policies have been adopted in these provinces in the matter of cotton grow[illegible] failure of Cawnpore American in his circle, the reasons for which are explained in my writ[illegible] Dr. Parr believed that the ginning percentage of *buri* was higher than that of *deshi* and it might compete favourably. American cottons are not more subject to disease than *deshi* but suffer more from the leaf-roller. This is worse on the smooth than the rough leaf. The ordinary middleman will not buy American except on the same basis as he buys *deshi*, that is, the ginning percentage. He will give nothing more for staple.

25. (*President.*) A small cultivator does not take his cotton as a rule to the market. He sells it in the village to a middleman who takes it to the larger markets. Most of the cultivators are probably indebted to middlemen or their landlords. The latter sometimes deal in various crops. The occupancy tenants are more free from debt and are often large enough men to sell direct. As a whole, however, it may be said that the grower does not receive the full market rate for his cotton and the only solution appears to lie in the formation of co-operative societies which would combine to sell their cotton in the market. It would be necessary, of course, for the societies to appoint an agent to do the selling and the growers would have to trust him to get the best price possible. Possibly a competent Secretary would be able to do the selling. Joint sales are a high phase of co-operation and will take time to bring about.

26. All the cottons grown in the United Provinces are known as Bengals Some, such as that grown at Chandausi, may rank as fine Bengals The forecasting of cotton is an extremely difficult matter in an area like these provinces where yields vary so greatly with the season I am not prepared to state how it could be improved In a year like the present, Aligarh White Flowered gave only two to three maunds of *kapas* on our farms whereas in a favourable year twelve or thirteen maunds may be counted on I do not think the publication of Bombay prices in the village *mandis* will greatly benefit the cultivator and I do not see any reason for going out of our way to assist the middlemen I do not therefore consider that the ... cotton I consider ... sent it is extremely ... and press them to ... United Provinces

latter deals directly with the tenants and the decision as to whether the cotton will prove popular must rest ultimately with the Deputy Director He will not go in for cotton if he finds that for particular reasons it is not popular with the growers If possible, the botanist's farm should be near the head quarters but this is not easy to arrange Seed farms should be in the hands of the Deputy Directors and the distribution of seed must rest with them This does not exclude the Economic Botanist from maintaining a farm to ... se the number of their seed ... ay for itself with a competent ... the purity of seed and seed ... al cotton department for these provinces which seems to me quite uncalled for as it would only be a half time business K 22 does not necessarily conflict with Cawnpore American because it can be grown on unirrigated land The variety it would displace would be Aligarh White Flowered An Entomologist is badly needed in these provinces as the ravages by boll worm are serious and a recommendation to this effect by the Committee would be very welcome

28 (*Mr Wadia*) The price of *deshi* fluctuates greatly and only averages over the season can be given The figure I quoted differs from that given by Rai Ganga Prasad which has possibly worked out on different data The price of *buri* cotton is much the same as Cawnpore American The habit of Cawnpore American is better than that of *buri* and so far as my experience goes it yields better and is not so late

29 The cultivator is in the habit of watering his cotton and so does the middleman when bringing it into the market. The brokers, however, are fully alive to this custom and discount it I do not think that ... *owever*, because ... prevent ... cotton ... acterise ... mixing ... selected

rule it out of existence but there is no reason why a rule should not be made for keeping *rui* and *kapas* separately and for enforcing structural alterations The conditions of licensing in my opinion should cover

the crop

31 (*President*) There are I believe clauses in the pool agreement ruling out the erection of new ginneries or their financing by members of the pool It would be only reasonable to refuse licenses for new factories in places where a sufficient number exist already I do not think you could compel a man to remove

his factory which was not working to some other place. He was perfectly within his rights in erecting it in the first instance and special legislation to this effect would be unfair as it would have a retrospective effect. It would certainly be to the advantage of ginners as a body if licenses were to be refused when there are already a sufficient number of gins and this would be some compensation for the control which would be exercised over them in any system of licensing.

32. (*Mr. Ashton.*) Water for sowing American cotton was last year concentrated on selected channels. No difficulties arose in regard to *zamindars* on other canals asking for similar treatment. What the Irrigation Department did was definitely to ensure growers of cotton an adequate supply of water. As it turned out, there was not much demand. Water supply in the canals in these provinces is not adequate to the demand and there are proposals for sending the Sarda water across to the Ganges and for additional storage in Bundelkhand. When the permanent barrage is built over the Ganges, the water supply will be better assured. At present we have only a temporary one on the Upper Ganges. What we are aiming at is a compact area of American cotton both for ginning purposes and seed selection and therefore it is very desirable that water should be concentrated on certain channels. Up to this time, the Irrigation Department have not seen their way to meet my request and this is the first year they have undertaken to do so. The Agricultural Department is not in favour of providing water for catch crops and we think that, because the crop is cheap, there is no reason why it should get cheap water. We would prefer that adequate water was given for the main crops, such as wheat, and for this reason I should like to see rates for catch crops raised. Among other things this will encourage the growing of more wheat which at the present time is very necessary.

33. As regards oil engines, their employment is not increasing at present. The price of oil is high and little plant is obtainable. I think the tube wells will go ahead in parts of the provinces where ordinary wells cannot be constructed, or give very little water. If Government were to undertake to construct a large number of tube wells and maintain them, a big mechanical staff would be required. It is preferable, therefore, that assistance should be given to *zamindars* in constructing them and running them, but their management should be left to *zamindars* themselves. If private firms were to take up the business, so much the better.

34. In those tracts in which water is concentrated for the sowing of American cotton, there is no restriction on sowing *deshi*. The object is not to prevent *deshi* being sown but merely to ensure an adequate supply for American without which it will not be sown. At present the water rate for cotton is Rs. 2. I should prefer to see it raised if an adequate supply can be assured. I see no reason why some slight preference should not be given to American in its early stages, that is to say, to encourage it, the rate should be Re. 1 less than *deshi*, provided that the rate for cotton generally is raised. I do not think that the Irrigation Department care for differentiation of rates. The Agricultural Department naturally, however, wish to encourage particular crops when they are somewhat new to the cultivators and their merit is not fully established. The Irrigation Department assess the rates. It is possible that differentiation of rates, etc., as suggested would not be popular. In the long run, however, I think it will be to the advantage of the Irrigation Department to make such differentiation because, in case American cotton became firmly established, they could always count on a large area under this crop annually. *Deshi* cotton need not necessarily be sown with irrigation and cultivators often prefer to wait till the rains. American cotton must be sown early with irrigation and to encourage it seems a sound business proposition. Cotton is not irrigated to any large extent from wells. The percolation level is deep throughout most of the western districts and irrigation from wells would impose a very severe stress on the cattle.

35. (*President.*) Government issues a good many loans for sinking wells. The co-operative societies do, I believe, include the sinking of wells among the objects for which grants are made. If the area commanded by the tube wells were to increase this would necessarily mean that a larger amount of American cotton could be sown.

36. As regards the question of an Imperial cotton expert, there would be difficulties in having one man for the whole of the country and I prefer something in the way of a Committee. If there were one man only, he would probably be a botanist and thus clash with the provincial experts. The Committee would include trade representatives. I think the control of one expert over another is apt to be resented and, in any case, it is extremely difficult for one man to try to control others far more intimately acquainted with local conditions than he is.

37. There is some considerable difference in my figures as to the average holding in these provinces and those of Rai Ganga Prasad. Mine are from three to four acres; his are from eight to ten. His figures seem to be vitiated by the exclusion of subtenants. The number of recorded tenants last year was 2[illegible]¾ millions and the area in their holding 38 million acres, which gives a very low acreage, but many of these probably hold jointly. My figures were taken from settlement reports which give an area of three to four acres. The main point is that our cultivators are small men and I am afraid it is only a very few that hold large holdings of eight or ten acres. The result is, therefore, that they prefer to go in for the hardiest crop such as Aligarh White Flowered and indeed many of them prefer to grow a mixed crop as an insurance crop. The improvement of cotton in the United Provinces, therefore, involves economic as well as climatic considerations and, apart from the uncertainty of the cotton crop generally, the small cultivator always prefers quantity to quality.

Supplementary written statement submitted by the Hon'ble Mr. H. R. C. Hailey, C.I.E., I.C.S.

Legislation to prevent the damping and adulteration of cotton.

38. Mr. Wadia at the meeting of the Cotton Committee asked me to put up a note on the question of legislation to prevent the adulteration of cotton. I have since had the advantage of reading the note prepared by Mr. Noyce for the use of the Committee on the subject of previous legislation on the subject. One interesting point is that the Cotton Frauds Act does not seem to have been an entire failure but had a certain, if not very great, deterrent effect and its repeal was followed by an immediate revival of adulteration in a very severe form. The second is that in the Punjab—and possibly this applies to other parts of India—the principal purchasers of cotton are the ginners and they are averse to letting out their factories to a Government Department whereas, in the United Provinces, no difficulty is experienced in hiring factories for ginning special classes of cotton.

39. The action suggested to me took two forms, (1) proceedings against the ginners by means of licensing, (2) against the dealers by some Act similar to the Cotton Frauds Act. It is possible that in other parts of India the terms are practically synonymous and therefore it would be difficult to touch one party without touching the other. This is not the case in the United Provinces. Some ginners work entirely on commission; others work partly on commission and buy themselves at the same time. Where the ginner works

on mm on t wo ll on le m e l m f h m d f

grower But prev ous history shows that any legislat on against such pract ces s extremely hard to carry nto effect and further that t met vi l great oppo on f om various b anches of the t ade not from any

w dely the United Prov n es t would not be onfined to a part c lar area To make leg lat on effe tual therefore t woul l be neces ry declare that any n ix ng of o

en pla e Se on lly t It n ay be due to the

ord nary d sh T

ANNEXURE I

Not by Mr B C Bu t Dep y D re tor of Ag c l u e Un t d P ovinces

P en on of Adul eratio of co on

As pointed out n Mr Hailey s note tl is quest on does not concern this prov n e int mately at present as tl e ch ef cotton we produce s las ed as Bengals A l mited quant ty s classed as fine Bengals and there f

little risk of deterioration by mixing. But we are at present engaged in the introduction of a staple cotton, viz.: Cawnpore American, and hope to have shortly a high-class cotton of improved staple to introduce. This problem may therefore be a serious one at an early date. The evils appear to be false packing, mixing of unginned cotton (*kapas*) before ginning either at the ginner [illegible] or by village dealers, the growing of mixed crops, and deterioration by hybridization.

False packing is common [illegible] and would appear to be capable of being dealt with as an offence under the Merchandise Marks Act. In any case, it is the least important of all as it only affects the particular consignment concerned. The mixing of unginned *kapas* of inferior quality with the *kapas* of a staple cotton is more important as it may lead, and has apparently already led [illegible], to the loss of reputation of an important class of cotton to the loss of both the cultivator and trade. By the growing of mixed seed and subsequent hybridization, a variety of Indian long-stapled cotton may be entirely lost in a few years. It is suggested that this could be remedied by the licensing of ginning factories and by making mixing a penal offence. The difficulties that would be encountered in this procedure [illegible]. Some ginners work only on commission for cotton merchants, others [illegible] very widely. A gin (with or without a press) may be entirely [illegible] many days per week [illegible]. A ginning factory may be buying [illegible] and also ginning on contract for other buyers [illegible]. The owner is not necessarily a good judge of cotton and, even in the case of [illegible], it would not be easy to hold him responsible for mixing done under the instructions of the owner of the cotton. Even if mixing in the ginning factory were stopped, there would still be nothing to prevent the dealer from mixing *kapas* before sending it to the ginning factory. [illegible] the village dealer) mixing *kapas* of various classes and not necessarily with intent to defraud but merely through carelessness or because the quantities dealt with are small. [illegible] of Cawnpore American. Since that variety can only be grown with success [illegible] cotton should be grown in the same villages as American or at any rate villages [illegible] would be growing both varieties. It is clear therefore that a dealer may [illegible] *kapas* [illegible].

Legislation therefore appears to be extremely difficult to enforce. The only means of preventing mixing appears to be (a) the organization of [illegible] which will make it worth while the grower keeping his *kapas* pure and which will [illegible] touch with the larger interests of the cotton trade to ensure [illegible] more remunerative, (b) adequate provision of seed farms to ensure supply of pure seed so that, even if mixing occurs in any one season, mixed seed is not sown again. In introducing a high-class cotton, an attempt would naturally be made to concentrate attention on limited areas but even so adequate arrangements for the supply of pure seed would be essential.

ANNEXURE II.

Note by Mr. H. M. Leake, Economic Botanist, United Provinces.

In putting forward my views as to the practical remedies for the adulteration of cotton, I do so with some diffidence as I have no practical experience of the trade. I am not therefore in a position to do more than outline what, in my opinion, are the essential facts which must be taken into consideration if effective legislation is to be undertaken and what the bearing of the facts must be on any scheme of legislation.

The essential fact is that the consumer desires to purchase his requirements in uniform consignments of the quality of which he can be reasonably sure. Unless he possesses full confidence as to quality, he will not pay the full intrinsic value of the grade he contracts for as he will have to allow a margin for the risk run. Taking the word adulteration in its widest sense to mean a lack of uniformity, it is first necessary to trace its origin. The first source lies in the field. By the growth of mixed types a mixed produce is obtained, and it is clear the dealer will not be in a position to handle pure produce of uniform quality if it is not raised in a pure condition.

The second source is the district; each individual field may be pure but, if different types are grown in the various fields, the produce *may* be kept pure but the process requires a degree of skill which it is perhaps impossible to expect all dealers to possess and which will only be evolved if it pays the dealer to exercise that skill. At present there appears to be no such incentive; adulteration is, in the first case, unavoidable and its avoidance, in the second, unremunerative. In neither case can it be called wilful.

The third source is the deliberate admixture of low, in order to obtain the price of high grades, in its worst form involving the railing of inferior cotton to a place which bears a name for quality. This is wilful adulteration and in principle should be punishable. Under the present conditions of cotton cultivation and of the trade, however, it is doubtful if the three classes of adulteration can, in the result (the bale), be distinguished and herein lies the difficulty of restrictive legislation.

Legislation can, however take two forms; a negative form, in which honesty is a consequence of the deterrent effect of punishment inflicted and a positive form, developing conditions which render honesty the best policy. The former, purely restrictive legislation can, to my mind, never be a real success; it involves the creation of complex machinery to carry it into effect and it diverts ingenuity to evolving methods of evasion. It is doubly undesirable in cases, like that under discussion, in which the difficulty in establishing wilful action must be great. From a perusal of Mr. Noyce's note, it appears that legislation hitherto enacted is of this nature and, before recourse is had to similar efforts, it is at least profitable to consider whether it is not possible to attain the desired end by the latter form of legislation.

I think something in this direction is possible, though, as I have said, I speak with some reservation. We can suppose a system of licensing presses and of marks which enforces the stamping of all bales with the name or mark not only of the press but of the dealer. Such a rule appears to me capable of cheap enforcement and to form no restriction on legitimate trade. The effect, however, will be considerable in that the consumer, who opens the bale, will be in a position to trace the dealer who was originally responsible for pressing the bale, even though the bale has passed through the hands of a number of middle men. The result would be that cotton, instead of passing under the general trade name of say "*Ujjain*" would pass as "*Ujjains mark,*" say "*Ram Pershad.*" It introduces a personal responsibility of the dealer which would in time have a certain market value. Dealers would find it pay to study and try to maintain quality and a premium would be placed upon honesty.

The effect however would go further, the dealer who buys from the cultivators would be in a position to pay for quality and purity and the incentive would extend to the cultivator stimulating the growth of pure types of superior quality

[illegible]

trade and private enterprise to evolve.

Mr. B. C. BURT, Deputy Director of Agriculture, Central Circle, United Provinces

Examined at Cawnpore November 1 [illegible] 1917

Written statement

I —Agricultural Experience

(*i*) "*Deshi*" *short staple cotton*

42 (1) **Experience** —I have been stationed at Cawnpore for some 10 years my circle includes three distinct cotton growing tracts —

(1) The lower middle and lower doab (districts Etawah Mainpuri Farrukhabad Cawnpore and Fatehpur)

(2) Part of the Lucknow division (Unao, Hardoi and Sitapur)

(3) The Jhansi division (Bundelkhand)

I am in actual touch with cultivators

43 (2) **Varieties.**—The cotton commonly grown in these areas is classed as Bengals The best of the cotton from the Jhansi division is classed as Fine Bengals It will be convenient to discuss these three tracts separately

(2) In the doab, cotton is largely but not entirely grown with irrigation. The area in these five districts in 1914 was 318 000 acres of which 176 000 acres were sown with irrigation. The total area in this tract

[illegible]

(4) In the Jhansi division, cotton is sown both with and without irrigation the area sown is largely governed by the date at which the monsoon commences and the character of the monsoon in the early periods The canals are storage canals and the amount of water available for cotton sowing is practically limited to the supplies from the previous rabi season which on the Betwa canal in particular is often practically nil

[illegible]

another portion and also cultivate other land as a tenant

(3) In the season 1914, the percentage of the cultivated area under cotton in certain districts of my circle was as follows these are not average figures but refer to a favourable year —

Doab	Etawah	14
	Mainpuri	11½
	Farrukhabad	7
	Cawnpore	12
	Fatehpur	6
Lucknow division	Hardoi	4½
	Unao	5
Bundelkhand	Jhansi	3½
	Banda	4
	Jalaun	5½
	Hamirpur	5½

(4) In Cawnpore Etawah and Mainpuri owing to the fact that there are considerable areas that are unsuitable for cotton growing the proportion of the cultivated area in the cotton tract rises to close on twenty per cent which is probably as high as sound rotations permit

(5) In Hardoi and Unao there is no canal irrigation The introduction of canal or tube well irrigation would doubtless lead to important increases in area as well as in yield and certainty

(6) In Bundelkhand much of the soil is totally unsuitable for cotton Additional canal facilities would doubtless lead to some increase in area but what is more important would largely stop the enormous fluctuations due to dependence on the nature of the monsoon

(7) In all discussions as to the possibility of increasing the cotton area, it is important to bear in mind that cotton is essentially a precarious crop in this part of the United Provinces. In non-canal districts, it is sometimes almost impossible to sow it when the monsoon starts late. This is shown at once by large fluctuations in area. Apart from this, the average year is too wet for cotton and damage by excessive and untimely rain in September and October is frequent. There is thus very great uncertainty as to the yields. The crop is one requiring considerable expenditure on labour for weeding and picking and there are many years when it barely pays expenses.

45. (4) **Yields and profits.**—The average yield of ginned cotton per acre sown with irrigation is about 220 lbs. per acre and without irrigation 110 to 120 lbs. Profits are extremely variable but are probably on a normal crop with normal prices about Rs. 15 per acre without irrigation and Rs. 25 to Rs. 30 with irrigation.

46. (5) **Rotations and manures.**—Cotton commonly follows wheat. In canal irrigated tracts, it is followed commonly by a catch crop of peas but, in non-canal districts, no other crop can be sown within twelve months after sowing cotton. Rotations in this province are inclined to be opportunist and ill-defined but the principal other crops grown in rotation with cotton are wheat, barley, *juar* and other millets, *arhar* and other pulses and gram. Cotton probably rarely occupies the same land more frequently than one year in three or four nor is it desirable that it should do so. Cotton is rarely manured direct, as direct manuring of cotton in average years not only does not pay but frequently leads to an undesirable growth of wood. On the other hand, the preceding wheat crop is generally manured to some extent and experiment has shown this to be the most economical way of maintaining fertility for cotton. Experiments with artificial manures on cotton do not indicate that any improvement can be expected in this direction. On light poor soils, particularly in dry years, cotton sometimes responds to general organic manures but I am not prepared to recommend any general change of practice in this direction. On the other hand, there is ample margin for better tillage, a point which will be referred to later.

47. (6) **Comparative returns.**—With present market conditions, the most profitable variety of short staple *deshi* cotton is one with high yield and a high ginning percentage. Long staple *deshi* cottons such as are grown in other parts of India cannot be grown here as the season is too short. Long stapled hybrids received from Mr. Leake are being experimentally grown in my circle on a limited scale but it is as yet too early to state the relative profits to the grower.

(2) Cawnpore American cotton, an acclimatised exotic, yields on an average as well as short staple *deshi*, is potentially a higher yielder but requires somewhat better cultivation. On normal yields and average prices, it yields the cultivator about Rs. 8 per acre more than irrigated short staple *deshi*. It cannot be grown without canal irrigation as it must be sown well before the rains.

48. (7) **Conditions affecting increase in area.**—This question has been partially answered above. The area of short staple *deshi* could be materially increased and made much more stable by improved irrigation facilities making the crop less dependent on the early monsoon. Apart from this, the area is governed by the relative prices of cotton and food grains, the cultivator being more influenced by the prices of the previous season than by future prospects.

49. (8) **Uses of seed and seed selection.**—Cotton seed is largely used for cattle food and there is a limited amount crushed locally for the manufacture of oil. There is a considerable export both to Europe and to other provinces.

(2) Seed selection is not practised to any considerable extent except in so far as good cultivators keep a certain quantity of seed for their own use. As usually understood, the selection of seed is unknown nor is it likely that anything of importance could be done by cultivators in this direction. In many districts hand ginned seed is preferred and a premium is paid for it not so much because of gin damage as because cultivators realise the value of seed of known origin. A large proportion of seed sown is however purchased from the market and eventually has come from the ginning factories.

50. **Improvement of *deshi* cotton in Bundelkhand.**— A brief reference should also be made to an attempt to improve the *deshi* cotton grown in Bundelkhand. The cotton grown in the north of Jalaun district and neighbourhood is known to the trade as "Kalpi" and is usually classed as "Fine Bengals." There is often a shortage of seed in this district following bad seasons and importation of seed from outside leads to a coarse cotton being grown. Selections have been made from local cottons and a pure race isolated with staple value by the mills as fully equal to the best "Kalpi," and with a high ginning percentage and yield. This cotton is now being multiplied for distribution. The recent opening of a farm of 100 acres in one of the large estates in the tract will be of material assistance

(c) *Exotic cotton.*

51. (20) and (21) **Experience and varieties.**—My experience of exotic cottons has been limited to an attempt to establish American cotton cultivation in the canal irrigated parts of the circle. A certain measure of success has been obtained in the introduction of Cawnpore American cotton, which was Upland Georgian in origin and was apparently originally introduced at the time of the Cotton Commission and has therefore been continuously grown in the province for a quarter of a century. This cotton is of about one inch staple and is bought on the basis of "middling American" and has met a ready sale at, on the whole, satisfactory prices. But for a series of bad seasons, there would probably have been a large area of this cotton under cultivation but its introduction has received a series of checks. In 1914, the general slump in cotton prices greatly disheartened growers and this and the subsequent competition of indigo caused a marked set back. The following years, 1915-16, were phenomenally wet years and crops were poor. In the current year, conditions were satisfactory at the start but the latter part of the monsoon was far from favourable.

(2) This cotton can only be grown on a limited area for the reason that it can only be sown with canal irrigation and must be sown in time to be well established at the commencement of the monsoon. The canal supplies are at their lowest at the beginning of May as a rule but increase towards the end of the month and in early June, with the rising of the Ganges as the snow melts. *Deshi* cotton therefore has this advantage over American that it can be sown either with [illegible] be sown so early. A scheme has been tried this year for the first time of [illegible] growing on certain channels to which the canal department guaranteed water supplies. It is as yet too early to judge results but it is clear that if American cotton is to be established some scheme of this kind must be worked out.

(3) Experimental work has been largely devoted to the isolation of the best races from the Cawnpore American for reproduction and distribution. A detailed examination of the crop showed that there was considerable variation in agricultural characters, in lint and ginning percentage. A number of

pure races have now been isolated and tested and the best are being multiplied. Valuations of the lint have been obtained in each of the last two years which show that, as regards spinning value, these selections are satisfactory An attempt has been made to select an earlier maturing variety to permit of later sowing but although types have been obtained which are no longer in vegetative period than the local *deshi* cotton these do not do well when sown late The reason for this appears to lie in a difference in the root system

52. (23) *Importation of seed* —A number of trials have also been made with imported American cottons, both obtained direct and through the courtesy of the Deputy Director of Agriculture Sind None of these have done well even after several years' acclimatisation nor has it been possible to isolate high yielding types from them In very dry years, *e g*, 1913, they yielded extremely well and good crops were obtained from a number of well known American varieties but in wet and average years they failed entirely One reason for this appears to be that all modern American varieties have a smooth leaf and are very susceptible to damage by aphis. The Cawnpore American has a rough leaf and provided that it is sown at the right time, is no more damaged by unfavourable weather than short stapled *deshi* cotton It follows from the above that any attempt to introduce American seed in bulk would be foredoomed to failure The introduction of the best types of the acclimatised Cawnpore-American offers the best prospects of success If a better cotton is required, it must be obtained by hybridisation. Extended trials were also given to Dharwar-American at Cawnpore but it was eventually discarded as unsuitable

II —COMMERCIAL ASPECT

53 *Market organization* —Any effort to establish a superior cotton, whether it be improved *deshi* cotton, a hybrid long staple *deshi* cotton or an acclimatised exotic is obviously handicapped by the present organization of the cotton trade This is not in any sense because the consumer is unwilling to pay a fair price Once cotton is ginned and baled, it commands even in Cawnpore its full market price provided that it can be offered in minimum commercial quantities and even smaller quantities can often be satisfactorily disposed of. But there is an unmistakable gap between the spinner or big dealer and the grower Unginned seed cotton (*kapas*) is bought without reference to quality except in so far as purchasing ginners pay attention to colour, cleanliness and often to probable ginning percentage Not only are the growers small men who frequently do not bring their own *kapas* into the big markets, but they are frequently in need of money and accept comparatively low prices from peripatetic buyers A perfect army of middlemen has thus sprung up between the ginner and the grower It is difficult to suggest an organization to deal with this In the introduction of American cotton, it has been necessary for the Agricultural Department to act as middleman and arrange for the purchase of the *kapas* at a reasonable premium and put the ginned cotton on the market Even in the early stages, this is a big strain on the department's staff which is limited and it is clear that some form of buying agency is required as soon as the crop reaches any important dimensions Unless a market can be guaranteed, the grower will not be bothered to grow long-staple cotton unless it pays him on yield alone This seems a matter for the cotton trade to deal with The Agricultural Department has as much as it can do to deal effectively with the introduction of new crops the supply of seed and demonstration of the correct methods of cultivation. In some parts of India *kapas* auctions have been organised to meet this difficulty I gather that they have been only a partial success but in any case they are inadequate for this province as the individual growers are mostly small men Co operative cotton purchase societies have been suggested and in certain areas may do very useful work But it is clear that such societies are only likely to be a success where the general conditions for successful co operative societies exist and these conditions are absent in many of our cotton growing districts Without buying organizations the department is deprived of an effective weapon *viz*, the enhanced price in the early stages of introduction of an improved cotton The spinner fails to get the new staple since it is absorbed in the much larger *deshi* cotton market and in addition the seed is mixed It is clear therefore that some form of commercial buying agency for stapled *kapas* is required which will organize the purchase of small quantities of *kapas* from the grower and arrange ginning and marketing With such an organization, the Agricultural Department could co operate with great advantage to both

V —GENERAL

54 (1) *General organization for cotton improvement* —As regards research and investigation the existing organization appears to be on right lines It has been suggested on more than one occasion that a special staff is required to deal with cotton improvement but this suggestion has been made without knowledge of the agricultural conditions of the province or the organization of the Agricultural Department Even where research officers are concerned, it is clear that, as there are two distinct seasons in only one of which cotton is grown, a research officer can with advantage take up the study of more than one crop. In the case of the Deputy Directors and the district staff of the department, the reasons are stronger Improvement of cotton cultivation is indissociable from general agricultural improvement The areas to be covered are very large and local knowledge and experience and intimate association with cultivators essential.

(2) A separate organization for cotton would be looked on with suspicion by growers and much of the influence which we have at present gained by contact with cultivators on various matters would be lost. As to the needs of staff for research purposes the Committee will already have received Mr Leake's views and I would merely add here that there is an obvious need for an entomologist to study cotton pests in Northern India. The damage caused at present by bollworms is very great indeed and in some years as much as 25 per cent of the crop is either lost or seriously reduced in value It is not unlikely that either legislation or general administrative action would be needed to deal effectively with the matter, but neither is justified until the problem has been much more carefully studied on the spot Apart from special research, the general strengthening of the staff of the Agricultural Department is essential. Deputy Directors' circles are much too large for efficient working The area of cultivation in my circle is ten million acres and includes three distinct tracts of very different character

55 *Organization of seed supply* —Apart from the question of staff the main need of the province in this direction is larger areas for Government seed farms It must be assumed in introducing any improved cotton (whether long staple or short) that the bulk of the seed produced by cultivators in the early years will be unfit for issue for sowing purposes owing to probable impurity due to natural cross fertilization. Much can be done by concentrating attention on limited areas, with the object of completely replacing inferior cotton at the earliest possible date it is obvious that, in the early stages the department must be in a position to send out large quantities of pure seed.

a million bales of cotton of shorter staple The requirements of Indian spinners are fairly well defined *viz*,

on of as

welcome

portance

While it

ationship

often far

must be

trade's

Mr B C BURT called and examined

nted to

to go

not be

in commercial quantities

he cotton where the best

as these had included a

gement we could not have

Re 1 4 was given to the cultivators

They always got more because we had

Re 1 12 *another* year Re 1-8 *and another*

The seed from the farm was given to the

This may have meant a lower price. The possible area that could be grown under Cawnpore American instead of *deshi* is about sixty thousand acres in my circle The total area of irrigated cotton is about 186 000 acres About one third of that could go under American but it would not be safe to go above this figure In the scheme mentioned in my written evidence for concentrating water on certain channels, there is not water for more than this area in time

The supply of

ises on water to

on to the Lower

ain factor is the

rise in the river owing to the melting of the snows which takes place in late April or May but the time is vari-able. We began trying to give out cotton in villages which were normally expected to get a good supply of water but this was unsatisfactory. We therefore decided to concentrate work in certain channels and arranged with the Irrigation Department to guarantee a supply at certain periods. There were no complaints this year but further experience of this arrangement is required. In cases in which American cotton is grown in the same village with *deshi*, there may be difficulty in getting the American pure. There is bound to be some mixture. The area under cotton in the Cawnpore district is 97,000 acres of which 51,000 is irrigated. In distributing an improved *deshi* cotton, there is the additional difficulty of deterioration by hybridization which can only be got over by complete replacement of *deshi* by the new variety. For this reason I should be loth to put out an improved *deshi* cotton unless it could be grown equally well with irrigation or without.

70. Cotton follows wheat as a rule and is grown on land which has been left fallow during the cold weather. The best cultivators plough their fields as early as possible with previous irrigation, irrigate again later and then sow. The most practice is to irrigate once and then plough and sow. Cultivation in lines is not making much progress. Where *deshi* cotton is sown with the rain, it is of doubtful advantage. Two or three hand weedings are given in July and early August. In very wet years weeding cannot be properly done. The objection to using imple-ments drawn by bullocks is that the fields are too small. There are few men with single fields of cotton above half an acre in extent. Many fields are exceedingly small. The subdivision of holdings imposes a limit on the improvement of cotton cultivation. Neither proper cultivation nor desirable can be carried out. After is sown with cotton. I cannot explain why the average outturn in the United Provinces should be higher than in the Punjab. Cotton forecasts err, if anything, on the side of being too low. There is enormous variation in yield from four maunds of *kapas* to twelve. Sowing on ridges has been tried at the experimental farms with Cawnpore American cotton. At first the method seemed promising but on the whole the germination was not satisfactory and the cost of making the ridges was considerable. Sowing in lines can be done with an ordinary country plough, sowing on ridges necessitates dibbling the seed by hand and also the use of a special ridging plough which few of our cultivators can afford. Sowing in lines and subsequent intercultiv-vation with the bullock hoe, on the other hand, is quite feasible and is profitable and this practice we are gradually introducing. A ridge and cultivator would have to be used. The use of co-operative implements might be possible. Sowing in lines is more important with American cotton than with *deshi*. *Deshi* will stand sowing at fifteen inches, American requires 2½ feet. American sown by cultivators is not often sown in lines but it is thinned out afterwards: probably three quarters of the American cotton is sown broadcast and the rest in lines. We have men who go round to show cultivators how to cultivate American.

71. It is largely a matter of chance if American suffers more than *deshi* on account of rain. It depends when heavy rain fall occurs in relation to the flowering time and the boll setting. It is not possible to lay down any rule about it. Last year, damage was done by continuous rain early in the year causing stunted plants. *Deshi* cotton is not so dependent on the number of bolls per plant for its yield and therefore did not suffer so much as American. This year it is the other way; the American cotton was well in boll and the *deshi* was just setting and therefore the American suffered less than the *deshi*. American has a better chance of re-covery than *deshi*, as it goes on flowering longer. American suffers more from bad cultivation than *deshi* and is not so tolerant of waterlogging. Waterlogging in the early stages causes general stuntedness. American cotton sown too late never grows properly. If sown at the right time, there is no difference. As to damage at flowering time, the American flowers more gradually and therefore is not so liable to damage by storms owing to mechanical knocking off of the bolls. Waterlogging would affect both alike. Our heaviest rainfall is usually in August with one break and in September in ordinary years with marked breaks.

72. (*Mr. Henderson.*) The seed of our cotton is distributed with the greatest care. The distribution of Aligarh White Flowered seed is not sound beyond a certain stage. Although the cultivators get a consider-able profit, the mills do not want it and an unlimited supply could not be absorbed. I refused to give it out in Cawnpore. In my circle, it is only being given out in two districts where there is no canal irrigation and where a hardy cotton is absolutely essential. It is spreading rapidly in Aligarh. Once a cotton is given out, one must be prepared to go on with it. The organisation for spreading Aligarh White Flower may be useful when there is something else to give out. The reputation of some of cotton tracts is past spoiling and therefore there is no danger in this respect.

73. The staple of Cawnpore American No. 7 and No. 9 is just over an inch. I have had no reports on these selections from Manchester but have had regular valuations from Bombay. Ordinary Cawnpore American has been valued in Manchester. In one year, the price of *deshi* cotton was Rs. 30 for 100 lbs. and American Rs. 44 to Rs.44-8 per100 lbs. of *rui*. That year we paid a premium of Re. 1-12 for American over *deshi*. There was really also a concealed premium as the cultivator was getting the full Cawnpore bazaar price and paid no deduction for weighment or trade deductions and sold his cotton at convenient places. I started selection work on Cawnpore American cotton in 1912. C. A. 7 and C. A. 9 are both good yielders and were valued as best as regards lint last year. It is the limitation on irrigation which prevents the spread of Cawnpore American. We could work up to 60,000 acres with improved Cawnpore American types. That would allow for one-third of the total irrigated area under cotton being Cawnpore American, provided there were no difficulties in regard to irrigation. We can only establish a large area of American cotton if Government will accept the policy of making special irrigation provision for it. Our canals are organised on a protective basis and to establish any large area of American cotton, which can only be grown with irrigation, the present arrangements for running channels need modification, *i.e.*, we must have a limited number of channels on full supply and running longer than the ordinary rotation.

74. The ideal improved *deshi* cotton would be better than American as it could be sown either with or without irrigation. The prevention of deterioration by hybridization is largely a matter of seed farm orga-nisation. Farm seed should be supplied to a village until entire replacement of *deshi* has been effected. As to the feasibility of introducing a *deshi* cotton which will have a longer staple or the same as that of Cawnpore American No. 9, I see no reason why it can not be done but we have no such cotton yet. Mr. Leake's work is directed to that end. The damage due to boll worm is equal for Cawnpore American and *deshi*. Actual countings of damaged bolls have shown that the number of worms is rather less in Cawnpore American than in *deshi*. For practical purposes the damage is the same.

75. (*President.*) Under the system on which cotton is sold in these provinces, there is very large number of intermediaries. It is impossible to say how many middlemen there are. Holdings are small and therefore there is a large number of individuals concerned. The man who goes round with a cart gives a better price than the *bania* does but he is a great nuisance. He introduces a tremendous danger of mixing the crop. In certain tracts in order to get American cotton brought in, arrangements had to be made with respectable

in favour of it as the individual cultivator is too small a man and cannot afford to wait for his money The local market is held once or twice a weak He expects to take his cotton there and dispose of it in small quantities He gets paid for it on the spot and does his marketing for the week at the same time It would be no use posting up Liverpool or Bombay prices in the village *mandi* as the cultivator would not understand them

decide whether the crop was sound for his circle or not Cotton pests are sufficiently serious to justify the appointment of an entomologist in the province Little is known about them except their names Egyptian experience cannot be utilised straight away I believe in the multiplication of seed farms We cannot have too many

78 As to the best organisation for co ordinating the work of long staple cotton the Imperial Cotton specialist is of no use to the United Provinces He has rendered assistance in regard to valuations which could be obtained direct from firms One man can only work on cotton for a particular tract The objection to a standing Cotton Committee, consisting say of two Deputy Directors a botanist working on cotton and two representatives of the trade meeting quarterly, would be that the members would be taken off their work at the most important time I do not see what such a body could do Every province should stand on its own legs

79 (*Mr Wadia*) There is very little deliberate damping of *kapas* Though there is no intentional damping the cultivators bring it in as wet as possible There are certain ginning factories which are ideally situated for mixing fine Bengals with coarse Bengals The only person who could stop all damping is the purchaser It is not very important here as the big buyers discourage it Watering of lint has been much exaggerated as far as these provinces are concerned I have no information to show how far it goes on As regards mixing the only way to stop it is by stopping the premium on the cotton sold When *deshi kapas* comes in mixed with American, it is very easy to detect it when it comes to the gin Nobody wants mixed cotton Spinners will not pay for mixture Mixing may be done by the ginner or by the man who gets his cotton ginned and the only way to stop this is to show that it does not pay The cultivator will soon learn if he loses his premium A system of licensing might

In this province many of
will be difficulty in proving
ame in and had nothing to
e else next time Certain
particular for fear of losing
ordered to be used for purposes other
twentieth to one fortieth of the seed only
not see how a system of licensing could

objection to the cultivator of *deshi* cotton being penalised by a heavy water rate with the idea of securing the cultivation of American cotton in well defined tracts where special facilities are being given for the irrigation of American cotton. If an improved *deshi* cotton proved as good as American, then I would stop American but that stage has not been reached. I would charge an extra water rate for *deshi* cotton sown in the well defined tracts I have suggested or else give a more favourable water rate for American. The water rate for cotton in this province is already low. The cultivation of *deshi* cotton under rain could not of course be stopped. American cotton does not cross fertilise with *deshi* and therefore when the two are mixed, it must be intentional. I would induce cultivators to grow American cotton by giving sufficient water. Agreements were taken from the cultivators only to use certain temporary outlets for sowing American cotton.

82. Extension of tube wells will have to be taken up by Government if any large tract is to be irrigated by this means. In Sitapur and Hardoi districts there are about three million acres of which two million acres are under cultivation which are mostly dependent on poor wells and therefore there are great possibilities for tube wells in these districts. The establishment for pushing tube wells will have to be a separate organisation. The possibilities in regard to tube wells are being investigated at present. Probably the work would eventually have to come under the Irrigation Department but a special circle would have to be made of it.

Mr. R. W. D. WILLOUGHBY, I.C.S., Registrar, Co-operative Societies, United Provinces.

EXAMINED AT CAWNPORE NOVEMBER 2ND, 1917

Written statement.

83. *Preamble* My knowledge of the technical side of cotton growing and the special economics of the trade is both superficial and second hand, and my views on these subjects would not, I think, have any value for the Committee. The only two matters in which I can contribute matter relevant to the enquiry would appear to be (1) the part hitherto played by co-operative societies in this province in the introduction of improved cotton strains and, in particular, long-stapled strains, (2) the part which co-operative societies may be expected to play, not only in the introduction of improved cotton, but in the direction of collective sale, if not collective production.

84 *Part played by co-operative societies in the United Provinces in the introduction of improved cotton strains* In all the western and central districts of the province in which there is a developed co-operative organization, something has been done towards the introduction of improved cotton, though the operations are as yet on quite a small scale. So far what has been done has been mainly in connection with the short-stapled Aligarh White Flowered variety, though efforts have been made to popularize Cawnpore American long staple in some central districts, and some *buri* has been given out in the north. As a sample both of the methods and scale of seed distribution, I will instance the Hardoi district. This district has two fairly substantial central societies, at Hardoi and Sandila. These banks sell for cash to cultivators in their better societies Aligarh White Flowered seed obtained from the Agricultural Department. In the last year they bought in about forty maunds of this cotton seed, previously passed by the department, paying the selected cultivators to whom the seed is distributed a substantial bonus over market prices. The department arranges for the sale of lint and ginning under supervision. This sample represents the most systematic work that has been done. Introduction elsewhere has been more sporadic and on a smaller scale though seed-distribution on similar lines has been undertaken in Jasrana (Mainpuri), Bulandshahr, Moradabad, and Bareilly and attempts have been made in Budaun, Unao, and other districts. We have sought to impress on the societies the necessity for concentrating on compact areas in order to avoid cross-fertilization and mixture of seed. That more rapid progress has not been made in the popularization of improved cottons is largely due to the fact that two successive cotton crops have failed under heavy rain and in a large tract of the cotton area, these failures were preceded by drought. The improved varieties have thus had small opportunity of demonstrating to the grower their superiority as paying propositions. Very much greater progress has been made with the introduction of Pusa wheat. Co-operation appears to have so far done very little towards the introduction of long-stapled cotton. This is mainly because in the districts for which the Agricultural department recommend Cawnpore American, *viz.*, canal-irrigated areas in Mainpuri, Etawah, Cawnpore, Farrukhabad, and Fatehpur, there is as yet little co-operative organization, except in Mainpuri and Fatehpur. Mainpuri has just started an agricultural supply association with a good building for storing seed and a respectable capital, and efforts will be made to utilize both this and the Fatehpur District Bank for the introduction of Cawnpore American. It is also probable that there is a fine opening for long-stapled cotton in the Muttra district with its short rainfall and canal-irrigation, though the latter has reached its limit and well-irrigation is difficult. Co-operative organization in Muttra is recent but fairly vigorous and something can be done to utilize it for pushing long-staple cotton.

(2) I have lately been moving the co-operative central institutions to assume responsibility for their seed operations, relieving the Agricultural Department of their commitment. The possibilities of loss are small where decent administration can be secured and where a small separate fund can be earmarked to guarantee the main credit organization against loss. I am afraid that for the next few years the development of the societies on the agricultural side is likely to be seriously retarded. Most of the larger and older banks have to grapple with a very serious problem in the shape of a mass of deteriorated societies which they dare not finance and either will not or cannot close. The mechanism of liquidation at present functions very slowly and very ineffectively, and the time of their staff is absorbed in tinkering with these societies to little purpose and to the detriment of development generally. The extent to which we can, in this province, look to the co-operative society as an agency for agricultural propaganda and improvement must necessarily depend largely on its co-operative quality and in the event of the Committee desiring further information on this point I venture to refer them to my annual report, a copy of which will be available in a few days.

85. *Part co-operative societies may be expected to play.* It is obvious that an extension of the cultivation of improved cotton can only be secured if it can be demonstrated to the peasant that it will pay him better to put down cotton than other crops and that it will pay him better to put down improved cotton than *deshi* cotton. The Government recently instituted enquiries in this province as to the possibility of obtaining for the actual grower a better return for his cotton by the improvement of the conditions of marketing. These conditions were examined by Mr. Hailey in a report (which is probably before the Committee) and

the conclusion which emerged was that the only way in which the ordinary grower could get a closer approximation to the market price was by
and himself selling through the aratya
into account the services performed for him
like a fair price for his produce in relation
of organizing sale for the grower co operatively My general impression was that, at the present stage of the development of co operation in this province it was not easy to see how cotton sale societies could be called into existence in the immediate future There are neither separate cotton markets nor does the cotton grower as such form a distinct class He generally grows cotton as an incident often as a somewhat subsidiary incident of his cultivation Even in the main cotton tracts though cotton is largely relied on to pay the rent the cultivator s interests are not concentrated on cotton to the exclusion of other staples It will not be easy to find compact bodies of cultivators who specialize so exclusively on

mental society in some specially favourable locality

(2) An interesting article on cotton sale societies appeared in the *Bombay Co operative Quarterly* of last June written by Mr Keatinge I C S and dealing with conditions in the Southern Maratha country It may be illuminative to compare the conditions there stated with ours The most obvious differences would seem to be that in the tracts he describes the cotton trade is the trade *par excellence* and dominates all others in the estimation of the people whereas with us cotton cultivation is an incident

Mr R W D WILLOUGHBY I C S called and examined

86 (*President*) Cotton is in this province only a subsidiary section of cropping and there are no

87. (*Mr. Wadia.*) The establishment of an agricultural bank on the Egyptian model and on the lines described by Sir D. Wacha's article, would, in my opinion, simply mean *takavi on a* large scale. I would refer the Committee to an article by Mr. Chatterjee in the Allahabad Economic Journal. The only staff available to such a bank for distribution and collection would be the same or a similar staff to that employed in the distribution and collection of *takavi* and there is no reason to think that the money would reach the actual cultivator at any lower rate of effective interest than that at which *takavi* reaches him. This rate, my inquiries show, to be certainly not less than fifteen per cent. on the average. It is usual for the cultivator to have to pass ten per cent. on the loan before he gets it and he often has to pay five per cent. or more when the *tahsil* staff has to collect. A State agency would have to be created and would cost both the Government and the borrower a very considerable amount. In my opinion such a bank would not be nearly as successful in organising cheap credit as co-operative societies. The agricultural bank in Egypt has not worked well and latter reports show, I think, that the preferability of co-operative methods was coming to be realised.

Rai Sahib GANGA PRASAD, Officiating Deputy Director of Agriculture, Western Circle, United Provinces.

EXAMINED AT CAWNPORE, NOVEMBER 2ND, 1917.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

(*a*) "*Deshi*" *short staple cotton.*

88. (1) **Experience.**—I have served in the Agricultural Department of the United Provinces of Agra and Oudh for the last twenty years, working in the Western Circle (headquarters Aligarh) for the last twelve years. I have been in actual touch with cotton cultivators, particularly in Aligarh, Etah, Muttra, Agra and Bulandshahr.

89. (2) **Varieties.**—Country white-flowered cotton, generally known in the educated world now as the "Aligarh White Flowered cotton":—

Length of staple $\frac{7}{20}$ to $\frac{12}{20}$ths inch.

Average $\frac{9}{20}$ths inch.

Percentage of lint—Maximum 41, average 38.

It is found either pure or mixed with the yellow-flowered *deshi* cotton. Where found alone, it has been introduced by the Agricultural Department.

90. (3) **Size of holdings.**—This varies considerably in different districts. About eight to twelve acres per pair of bullocks or a plough may be taken as a fair size of the holding. The proportion under cotton further varies considerably, depending on trade, irrigation and the nature of the rains. In the irrigated tracts, it may be taken as two to four acres per plough and nearly two acres in the tracts depending on the rains. This distribution of area is from my personal knowledge and is not based on any statistics. Other witnesses may throw further light on the point.

91. (4) **Yields and profits.**—The yield of the crop sown early with irrigation is about ten maunds, from that sown late with the rains about seven to eight maunds of seed cotton per acre. Sometimes with the bad distribution of the rains, the early sown cotton gets spoiled and the late sown takes its place in outturn. The profits are to be calculated on the basis of the yield per acre and the market rate. The calculated maximum cost of cultivation on irrigated crop comes to about Rs. 32* per acre, but, on the crop sown with the rains, it decreases by about Rs. 6, *viz.*, the cost of irrigation. Supposing Rs. 8 to be the market rate of *kapas*, the profit on ten maunds yield comes to Rs. 48, and on eight maunds to Rs. 40 per acre. These will increase or decrease according to the yield per acre and the price obtained in the market.

	Rs.	a.	p.
* Two ploughings and sowing	2	8	0
Seed	1	0	0
Irrigation charges and wages	6	0	0
Three weedings	4	8	0
Rent and manure	18	0	0
TOTAL	32	0	0

92. (5) **Rotations and manures.**—The usual rotation is cotton after wheat or sugarcane. Generally the previous crop of wheat or sugarcane is manured with the *ghoora*.† The same manure, *viz.*, the *ghoora* is applied to cotton where it is sown on land having had an unmanured previous crop.

† The *ghoora* is the village dung hill manure consisting of cattle dung, house sweepings, kitchen ashes and every kind of other refuse from the house, cattle-shed and stable.

93. (6) **Comparative returns.**—On account of its good outturn per acre and high percentage of lint and good colour Aligarh White Flowered cotton has been found to bring the cultivator more money than the mixture of white and yellow-flowered cotton commonly known as the ordinary *deshi* cotton.

But in comparison with the *American* cotton introduced and purchased by the Department at an increased rate in the *favourable* year, the return was slightly less. They may be compared as below:—

Name of *kapas*.	Outturn per acre.	Market rate.	Value.
	Mds.	Rs.	Rs.
Aligarh White Flowered	10	8	80
Deshi or the mixture of white and yellow flower	8	7	56
American	10	9	90

94. (7) **Conditions affecting increase in area.**—The area under cotton fluctuates largely, the reasons being the prospects of future demand based on the previous market, irrigation facilities and nature of rainfall.

It will increase with the demand to a certain limit if the climatic conditions are favourable. The factors limiting the increase are—

(a) decline in prices;
(b) cultivator's own distribution of his holding over other necessary crops, and
(c) crop rotations.

95 (8) **Uses of seed and seed selection.**—Seed is used as cattle food, chiefly to milk buffaloes to increase the outturn of *ghee.*

[illegible]

get.

(b) "Deshi" long staple cotton.

97. (11) **Varieties.**—The yellow flowered country cotton or a mixture of yellow and white flowered:—

Length of staple $\frac{13}{16}$ to $\frac{15}{16}$ths inch.

Percentage of lint—Maximum 34, average 33

98 (13) **Yields and profits and comparative returns**—As compared with the *deshi* short stapled cottons,

[illegible]

have been utilized The soils are light and well drained The climate favours length and softness.

100 (16) **Suitability of existing varieties**—There is a wide field to select and push still superior types, provided that they are as hardy and as good yielders as the existing ones There must be Government farms specially for cotton to study, acclimatise and demonstrate the varieties.

101. (17) **Prevention of mixing of different varieties**—To prevent the mixing of different varieties in the field, supply pure seed, organise supervision of expert and reliable trained men, keep the crop pure by pulling out the other varieties, compensate for the plants pulled out, give training to the growers in the villages by organising village unions and demonstrations To prevent mixing in the factories, have trade unions for the markets, do not buy mixture for any appreciable price, pay better for purity and award prizes and medals at exhibitions The ginners will gladly gin separate There should be seed farms and firms to supply pure and reliable seed

(c) Exotic cottons.

102 (20) **Experience**—I have conducted experiments at the Government Farms at Cawnpore, Aligarh, Kashipur (abandoned), Nawabganj, Bareilly, Muttra, Agra, Saharanpur and Bulandshahr I have been in touch with the cultivators of Aligarh, Etah, and Bulandshahr, where exotic cotton has been introduced for the last twelve years

103 (21) **Varieties**—Cawnpore American and *buri* are the varieties grown.

104. (22) **Size of holdings.**—Exotic cotton has not been taken up by the cultivators as their common crop. They sowed it for trial on a small scale on the inducements given by the Agricultural Department

105 (23) **Comparative returns**—The yields in favourable years have been about six to ten maunds per acre, but only in a year or two In most of the years it has been a disappointment to the grower The produce was purchased by the Department at Re. 1 or Re 1 8 per maund over the country *kapas*, and, in two years, small amounts of bonus were paid after disposing of the outturn

[illegible]

108. (26) **Suitability of existing varieties**—The Agricultural Department introduced the most suitable type available, viz., the Cawnpore American and the *buri*, but both of them have been found unsatisfactory. The Cawnpore American stands the leaf roller and the rains better than *buri* But its percentage of lint to seed is a little lower *Buri* is badly attacked by the leaf roller. None of them could be grown

successfully with the rains. There is therefore need for a better type than either of these two for these districts if an exotic cotton is to be introduced.

109. (28) Importation of seed.—In my opinion, the seed selected and acclimatised in the country in which it is intended to be grown is better and safer than the fresh seed imported from America or Egypt. My previous experience of Cawnpore with the fresh seed is as below:—

First year.—All the seeds did not germinate. All the plants did not fruit. Fruiting was scanty. All the bolls did not open well. The opened bolls contained a larger portion of the seed-cotton shrunk and insect eaten. The staple of the sound and well opened bolls was excellent in fineness, length and glossiness. The next year's crop from the seed produced was better, but the fine qualities began to deteriorate. This happened year after year until we arrived with some varieties to a limit where deterioration stopped and the seed was acclimatised sufficiently to give a satisfactory crop when sown early with irrigation. The Egyptian cotton was found more delicate than the American. For expert opinions on the lint see Cawnpore Farm Reports for 1893-94 and 1897-98.

110. (29) General economic conditions.—For *deshi* long stapled types better than the existing ones the chances are much better than for exotics. There should be local Government Farms to test and select the types and study the conditions. Climatic conditions differ greatly in different localities not far from each other, so that the type suitable to one place is found unsuitable to another.

ANNEXURE.

Statement showing maximum outturns of kapas (seed cotton) as given in the annual reports of the Aligarh Farm.

Year ending 30th June.	Aligarh White Flowered.	Yellow flowered or country.	Cawnpore American and *buri*.
	Mds. S. Ch.	Mds. S. Ch.	Mds. S. Ch.
1907	7 4 6	7 17 9	5 21 7
*1908	*7 6 6	*5 37 1	*11 17 9
1909	Not sown.	10 5 14	5 5 14
1910	3 13 11	7 20 0	4 32 3
1911	7 32 8¼	5 12 14½	Not in report.
1912	13 36 9	12 32 8	Experiments re-started but no figures given in the report.
1913	17 29 14	11 20 9	8 14 5
1914	10 21 2	6 34 12	9 33 9
1915	8 38 5	(K.21)6 29 6	4 0 5
1916	12 36 11	(K.22)9 25 8	9 28 1
1917	11 17 5	7 21 1½	6 16 3
AVERAGE	10 3 10	8 12 8	7 9 15

* Dry year.

N.B.—The outturns are for the year preceding the year given in the first column.

Rai Sahib GANGA PRASAD called and examined.

111. (*Mr. Henderson.*) This has been a very bad year for cotton. Of the two cottons, *deshi* is the better this year. I think it will give the better outturn. Taking the farm as a whole, I think the *deshi* outturn per acre will be about 1¾ maunds and that of American about 1½ maunds. There are still some bolls of American to open but it is doubtful whether they will yield anything. There is very little difference in yield between the two on the farm land but on the cultivators' fields, American is a total failure. The actual maximum outturn of seed cotton at the end of the season (1917) was 4 maunds 25 seers of *deshi* and 2 maunds 7 seers of *buri* American at the farm. The cultivators have got something from *deshi* but nothing from American because the *deshi* stands the rains better. Boll worms generally attack American as much as *deshi*. As a rule, there is very little boll-worm or none in *deshi* in a dry year. I am not sure that American cotton is worse than *deshi* as regards boll-worm but I am quite confident that leaf-roller is worse in the case of American than in that of *deshi*. On the *deshi* cotton at Aligarh, we have no leaf-roller. On an average, I should say that in a good year the outturn of American may be better than *deshi* but in a year of excessive rainfall, *deshi* is better than American.

112. As to whether if a premium of Rs. 3 per maund over *deshi* were given for American cotton, it would be grown in preference to *deshi*, I should say that it would take some time before it became a general crop: it depends upon the market. I do not think that even if you paid a premium and established a buying agency, it would help American cotton to be taken up largely by the growers. I do not think the chances of American are very promising. The cultivator prefers *deshi*.

113 About fifty or sixty per cent of *deshi* cotton on irrigated areas is followed by a catch crop of barley or peas That is sown in November You could not sow it in the case of American cotton as [illegible] n up to the end of January As a [illegible] ollow cotton in the same year It [illegible] after the plough for American cotton as in America That is cheaper and easier The cultivators are also recommended to use the tined hoes when sowing in lines These hoes can be used when the crop is sown in lines There is no system of ploughing cotton by the *deshi* plough followed here Only *juar* and maize are ploughed. The cotton crop is hand weeded three or four times by hand *kh urpas* The contract price for such weeding is Rs 1 8 per acre for one weeding only

[illegible]

[illegible] like to keep American cotton standing in the field up to the end of January He has to clear his fields so that he can sow some other crop It is the case that most land cultivated is *rabi* This year that is particularly the case because we have had plentiful rains and there is plenty of moisture

115 We have induced some people to grow American cotton The *kapas* is brought into Aligarh from a radius of about eight miles and the Agricultural Department makes arrangement to gin it We give a premium of about Re. 1 or Rs 1 8 a maund In some years we have been purchasing from the *cultivators' houses We have been sending round our own people to collect the kapas and we were also* paying a premium In Aligarh there are two customs in vogue In some places the *deshi* cotton is sold a the cultivator s house the purcha ers going there So in this case we have to send our men to purchase [illegible] villages In the other [illegible] *ur purchases in centres* [illegible] ll to anybody else He [illegible] house they do not dry [illegible] ldy [illegible] I [illegible] My [illegible] near Aligarh.

Mr. H M LEAKE, Economic Botanist, United Provinces

EXAMINED AT CAWNPORE NOVEMBER 3RD, 1917

Written statement

I —AGRICULTURAL EXPERIENCE

(a) and (b) "Deshi" cottons

117 (1) Experience —I came to India in 1901 and joined Government service in 1904 as Economic Botanist to Government United Provinces Since the latter date the question of the improvement of cotton has been my main subject of research My experience has been practically confined to the United Provinces till last year when *I accepted a position as adviser to Mr Coventry on questions of growing cotton in the* Central India States

118 *Definitions* —In the questions issued by the Committee cottons are divided into three sections *deshi* short staple *deshi* long staple and exotic It will prevent misunderstanding if I define the sense in which I interpret these descriptions in the following Short staple cotton is one from which the lower counts up to 20s or 24s can be spun long staple one spinning counts above this A further definition and one on which I should be prepared to lay greater stress is that a long staple cotton is one which would find a *ready sale on the Lancashire market*

[illegible]

my notice and I have consequently formed opinions on some of them I propose to leave the statistical and *agricultural aspects aside and limit myself to that portion of the cotton problem with which I have more* especial concern

(3) A further difficulty is that yield has, in the case of cotton, a double meaning. Of the crop yield (*kapas*), only the smaller portion (*rui*) has the major value. Hence the proportion of *rui* in the *kapas*, in other words the ginning outturn, is a vital and, under present market conditions, a dominating consideration.

120 (2) **Varieties.**—The cottons of the United Provinces come entirely under the class of "Bengals" and the plant grown throughout the main cotton tracts is a form of *G. neglectum*. In the eastern districts of the United Provinces, a form known as *G. intermedium* is found but the extent to which it is grown is negligible. The *neglectum* cottons are all short staple and, as grown by the cultivator, consist of a variety of types mixed together. As a general rule, the ginning percentage of these is about 33 which may be considered as the standard. In recent years a type has been introduced known as the "White Flowered Aligarh," practically identical with the *roseum* of the Central Provinces. Its favourable characteristics are its hardiness and its high ginning percentage, about forty. Its good qualities end there. The lint is coarse and short and I hold a letter from a Bombay mill-owner in which he pertinently asks if I am aware that a cotton requires two ends to spin. Nevertheless I do not consider its introduction a mistake. It undoubtedly pays the cultivators to grow it and it will continue to do so as long as *kapas* is bought mainly on a basis of ginning percentage. Indirectly it has permitted the development of friendly relations between the Department and cultivators and developed an organisation which will be of use for the spread of better forms when available.

(2) On the other hand, it has increased the difficulty of developing a better class of cotton. As I have said, the test of any crop is the money return given by a unit area. The introduction of the Aligarh White Flowered cotton has undoubtedly raised this return for the grower and has set a higher standard against which new forms have to be judged. In the absence of payment for quality, it has been essential that any new form should possess a ginning percentage equal to that of the Aligarh White Flowered. So, and so only, can the cultivator be asked to grow it. Given a plant equalling the Aligarh White Flowered in yield and ginning percentage, the cultivator can be asked to grow it with confidence. He will not lose by doing so and, if it possesses quality as well, it will have a potential value which can be taken advantage of as the development of a system of purchase by quality develops.

121. *K. 22 and K. 28.*—This is the problem I have set myself to solve. I may say at once that the problem of producing length of staple is comparatively simple and working on a 33 per cent. ginning basis, improved cottons as regards staple would be readily produced. The production of high ginning cotton is a different matter. From the breeders' point of view, ginning ... most elusive and complex problem (*vide* my paper in the Journal of Genetics, Volume IV, ... I have had some success in solving it. I have now two races which will, I think, hold their own even against the Aligarh White Flowered. One of these, known as K. 22, has been in my possession for some time as a type with good lint quality. That quality is shown by the following facts:—

1914.—Quotation in Bombay.

Basis M. G. Rajputana Rs. 225; value Rs. 290.

1915.—Basis Cawnpore *deshi* Rs. 25 per 100 lbs: 15 bales sold at Rs. 30-6 per 100 lbs.

The following is an extract from a report on K. 22 and K. 7 cottons of the same year, *i.e.*, 1915.

"It (K. 22) is considerably superior to the best *deshi* which we usually get. This year, however, owing to the exceedingly poor quality of the majority of the *deshi* crop, it would be worth at least Rs. 2 per 100 lbs. above this season's fine *deshi* making it, I think, about Rs. 28. The particularly good points about this cotton are its fineness and regularity in length of staple."

1916—Basis Cawnpore *deshi* Rs. 32 per 100 lbs.

8 bales sold at Rs. 36 per 100 lbs.

The following is an extract from a report on K. 22 from a Lancashire broker.

"The sample of cotton you sent is certainly usable by a considerable number of Lancashire spinners provided they could not get anything better, they being very conservative."

(2) K. 22 is now being grown on a considerable area in Etawah and elsewhere. I have, however, only recently worked up its ginning figure to forty. In this condition, it is now pure and it is merely a question of time for the multiplication of seed.

(3) The second is known as K. 28. It is only recently isolated but it has a lint undoubtedly superior to K. 22. At present its ginning percentage fluctuates between 37 and 40 and I have little doubt, with the experience gained, I shall be able to purify out a race ginning forty per cent.

(4) From the above reports it will be seen that K. 22 practically reaches my definition of a long staple cotton while I anticipate that K. 28 will fully do so.

122. *Fuzzy* versus *naked seed.*—This is not the limit of improvement I hope to achieve and I may revert to my fundamental statement that the crop must be judged by the value of the produce from a unit area. The lint is the most valuable, but not the entire, produce. There is also the seed. The cotton seed industry in India is in its infancy but will develop and Indian cotton seed is handicapped by the pressure of the fuzz adherent to the seed. This fuzz not only lessens the value of the cake derived but it diminishes the value of the seed as a direct fodder. The advantages of a naked seed are clear. At present no Indian cottons are naked seeded. I have, however, been able to produce such forms and the process of adding this character to the already existent good qualities of K. 22 and K. 28 is now in course of development. Here again the main difficulty has been that of the ginning percentage, most naked seeded plants having a low ginning figure (even as low as eight). A second difficulty has been found in the poor habit—susceptibility to wet weather—of naked seeded plants. Both these difficulties have been overcome and I now possess naked seeed plants both resistant and ginning forty per cent.

123. *General aspect.*—I have so far dealt in some detail with the particular problem I have set myself to solve. I may now deal with a more general aspect of the case. The United Provinces cottons are entirely short staple and the long staple *deshi* cottons of other tracts have all failed to grow as an economic crop under the United Provinces conditions. For improvement of staple, therefore, it is necessary to turn to breeding of new races. The question arises whether there are any reasons for anticipating a limit to the extent of improvement available. I think there are. The cotton season of the United Provinces commences in September ... inues throughout October and even later. This is a season marked by a rapidly falling temperat... days and heavy night dews. The effect upon the lint is marked. In any race there is a marked ... quality, both in length and silkiness of successive pickings. Produce made up of such ...orm. First and second pickings may fully satisfy the Lancashire market but the

subsequent ones will not do so I consider therefore, that the United Provinces must remain as it is at present, an essentially short staple tract and the improvement limited to one which will give a cotton normally supplying the local demand but in emergency, capable of being used in Lancashire Our first duty as members of the Agricultural Department is to look to the interests of the cultivator and if we can introduce a cotton of this type we shall benefit him As the report I have quoted shows, we have made appreciable progress towards that object

(c) *Exotic cotton*

124 (20) **Experience** —I have not personally any large degree of experience with the c General experience has not been of any marked success and I was early led to the conclusion that improvement of indigenous races rather than acclimatization of exotics was the most promising line of success The work of acclimatization is not so technical and what has been done is under the direction of the Deputy Directors

125 (25) **Conditions affecting increase in area** —The exotic cottons are not as a rule hardy in the sense that the Indian cotton is hardy In a good monsoon, they flourish exceedingly and run to leaf an[illegible]

conditions are thus largely against their extensive cultivation They require further more careful cultivation, especially better spacing than the *deshi* cottons This means a change of practice always of slow development with a conservative class While therefore I do not consider their introduction on an economic scale impossible I consider that it is improbable and that the best results will be achieved with *deshi* forms

126 (9 and 29) **General economic condition**.—*The main economic feature which comes out from what* I have said above is the absence of any market for quality I believe it true that the consumer will pay for

[illegible]

duced by me Under the Departmental organization, I control a farm which permits of the growth of some forty acres of cotton annually This seed is made over by me to the Deputy Directors for issue to cultivators from whom the Department buys back *kapas* Clearly this if it is to be efficacious, involves a large amount of work and a considerable capital Of this aspect the Deputy Directors can speak with greater knowledge My experience is limited to the sale of the few bales produced from my forty acres In these transactions I am repeatedly met by the remark that if I could provide 100 or 1,000 bales of the same quality a considerably increased value would be paid The production of such a quantity is beyond the capability of Government farms and beyond the financial and staff capacity of the Department Consequently there is a hiatus between the stage at which the Department leaves the distribution and the stage at which the trade is prepared to handle the produ[illegible]

[illegible]

which extension by Departmental agency is effective is below that at which the trade is prepared to undertake the handling This hiatus requires to be bridged

5 It is improbable that exotic forms will to any extent replace *deshi* forms for general cultivation in the United Provinces

recognition of quality but this recognition is limited to the source of the baled cotton that is the locality from which the bale is railed This defective organisation re acts adversely in two directions The cottons will lose their good name on the market and the source of supply of the good-quality—the field—is becoming adulterated Two lines of action are necessary to control this—the local crop requires to be purified and the practice of importation of *kapas* to the gins requires to be checked The first alone falls within my province

130 *K 22 in Central India*—*Under my advice Mr Coventry is starting a process of selection to* obtain pure races of the original Malwa types There is however another, perhaps a quicker, method. Samples of K 22 seed were supplied by me for cultivation in 1916 The results have been so promising that

I have this year sent a considerable bulk of seed of this type to various localities in this tract. The quality of lint of K. 22 when grown in Malwa is shown by the following extracts from reports forwarded by Mr. Coventry on the cotton grown in Malwa.

"K. 22.—This cotton grown out of Cawnpore seed on the Indore Farm seems to have improved in staple and feel, though it has not so much acquired the strength and length of Indore cotton. Can spin up to 20s. weft. Value Rs. 350."

"We place them in order of merit as under :—

First No. 7 (Dewas). Then No. 6 (Ujjain) and last No. 5 (Indore). Dewas seems to be very silky and clean. Ujjain is uniform and strong: but for its fineness we would place it over Dewas. Indore is short in staple, weak in strength and very able. Dewas and Ujjain are both good for 20s weft and both may be valued at Rs 365. Indore is good for 14s to 16s reeling. Value Rs 310."

Basis of prices on 23rd March 1917.

	R
F. Bengal	300
F. Khandesh	340
F. Akola	370
Indore Ujjain	355
F. Broach	410
Sawginned	410
Madras Cambodia	440
Bani Hinganghat	450

(2) This is a great advance on the quality of the same kind grown in the United Provinces. K. 22 is, thus, intrinsically, a far better kind than would be anticipated from an examination of United Provinces samples only—a fact which adds force to my conclusion that the United Provinces will never grow really long staple cotton. In the Malwa tract, cotton does not ripen on a rapidly falling temperature. The air remains moist and warm and the fibre dries off, when the boll opens under the most advantageous conditions.

(3) In the Malwa tract itself, the cultivator is accustomed to a cotton ginning 25–28 per cent. The prospects for a race with a quality equal to Ujjains and ginning 36–40 per cent. are thus very promising.

131. *Yield in Central India.*—Two other points I may mention briefly on this subject. The first is the low yield. I consider this an essentially agricultural problem and my remarks on exotic cottons in the United Provinces bear on this. The cotton soil of Malwa, owing to the way the soil expands on wetting, soon becomes water-logged, root development is checked and consequently the plant remains stunted. In the absence of irrigation facilities early planting is not possible, and it must be on the first rains. Improvement in cultivation should, I think, overcome the difficulty but I have no personal experience of such soils.

132. *Dirty nature of Central India Cotton.*—The second point is the dirty nature of these cottons. I believe this to be mainly a labour difficulty. The villages are scattered and the fields frequently distant. Picking is, therefore, made at long intervals with the result that a large portion of the crop is gathered off the ground.

133. *Cotton under irrigation in Central India.*—The second problem is to find a cotton suited to the irrigated lands near villages. These are, to a large extent, poppy lands which have been liberated by the policy of closing down the Malwa poppy area. Of the tracts of which I have personal experience, I consider these the most suited for the growth of really long staple exotic cottons. Success will depend on the selection of a suitable kind and on the provision of the extra cultivation which, in my opinion, all exotic cottons require. I have been able to suggest no particular kind likely to answer the purpose but Mr. Coventry is, I understand, experimenting with numerous forms.

134. *Conclusion.*—I have in the above given the Commission an outline of my work and its aims. I think the experience obtained in Central India indicates that the work is of more than Provincial value and that it is possible that some of the forms I have produced will be found suited for wider tracts than the United Provinces. I have this year supplied seed of K. 22 to several places in the Central Provinces but have as yet received no reports on them.

Mr. H. M. LEAKE called and examined.

135. (*Mr. Henderson.*)—I do not think that, owing to the war the problem of the improvement of cotton growing in India as a whole has altered. The war has not altered the problem but has made it more emphatic. The demand for long staple cotton is more acute now and is much greater than before. The war has shortened the number of years in which the problem will become intensive.

136. I think it is a very doubtful policy to continue to push Aligarh White Flowered cotton. It has got its advantages as well as disadvantages. Hitherto, the advantages have, to my mind outweighed the disadvantages. It has given Agricultural Officers a means of getting in contact with the cultivators. Whether this will continue to be, or even now is still, the case is a doubtful question. I think its cultivation is likely to spread as long as it pays the cultivator, and as long as it pays the cultivator, I do not see how it can be stopped. It pays the cultivator at present but I do not think that it will pay in the long run if a market for long staple cotton can be organized. There is undoubtedly a serious danger of the spread of Aligarh white flowered cotton destroying the reputation of a tract of country famous for a certain kind of cotton such as Malwa. This is a serious danger because the price of cotton depends on the name of the district from which it comes and if bad cotton is given out the name of the district will eventually be spoilt. No one has a good word to say for Aligarh White Flowered cotton except the grower. A few years ago, when Mr. Johnson was here, he paid a premium for it but now the mills will not look at it. Mr. Johnson used it and knew about it. Opinion has swung round altogether since then but I am not prepared to say what has been the cause of the change. In hot dry weather, Aligarh White Flowered cotton curls up and cannot be straightened out. I am inclined to think that most of the Aligarh White Flowered cotton is bought up for Japan. If this is so and there were an alteration in the Japanese market, the cultivator would be badly let down. There is another danger, namely, that if the spinners find that it does not suit their purpose, the price will go down. Of the two, I believe the greater danger lies in the alteration of the Japanese market. There is a distinct danger of the price suddenly dropping and the cultivator being badly let down. I am not prepared to go so far as say that the policy of giving out Aligarh White Flowered cotton is more or less suicidal as I do not know

a decided risk

of staple up to

will not be as

annot say what

oint, as I only

h whilst others

more difficulty

Middling American and *deshi*. If ginning percentage is not taken into account, my improved strains should give as good a yield as *deshi* The present prices are Rs. 43 for Punjab American, Rs 31 for

and to my improved varieties. No American cottons I have come across are as hardy as *deshi*. Of the

I should not know how to set about work on American I do not know if there are any tracts in *America where similar climatic conditions* to those in the United Provinces prevail, but I do not think there

an

ed

n

he

le,

140 Boll worm danger is very extensive in some years in the United Provinces. It is appreciable in

any consequence

141. (*Mr. Roberts*).—As to the work that I am doing here in the way of breeding and the principles on which I am working, the first step was to find out what cottons there were and to obtain them in a pure condition. The next thing was to make up my own mind as to what the ideal cotton was—I mean ideal within reasonable limits—and then, by breeding from the material I had at hand, to get as near the ideal plant as I could. The ideal plant had, of course, to be within a reasonable limit, *i.e.*, it was no use to aim at a staple of 1½ inches. The characters were studied from a Mendelian point of view, *i.e.*, crosses are made and from the offsprings raised by selfing pure races are selected out. By this means, I got a number of cottons which, on examination, showed different qualities but the size of the culture is naturally limited by the amount of self fertilisation that can be practically affected. This does not afford a test for agricultural characters, and it is only by going on further with them that I could know which were the better ones. In this preliminary selection, every plant is judged on its offspring of the following year. This selection is a scientific selection. With a sufficient number of offspring all bearing the character, it is possible to conclude in one year that it is fixed. The selection is not field selection but scientific selection. The principle of work is applicable for the whole of India. There is a good deal of scope for this work outside this province.

142. As regards the staple of American cotton, the constant selection of long staple types seems to be followed up by a decrease in yield. It is very difficult to explain this in simple terms. I think that there is confusion between two fundamentally different scientific factors. In one case, you are dealing with fluctuations and in the other you are probably dealing with unit characters. Field tests are of extreme importance in breeding work. There is no *a priori* reason why K. 22 should yield less than Aligarh White Flowered because it has a longer staple. A practical test must be made in regard to yields. I have evolved much better types than K. 22 if merely considered for their quality of lint but they had to be discarded on account of low yield. The factors controlling yield cannot be fully defined. They may be botanical characters subject to environmental influence, for instance, you cannot get a tree cotton which gives a good yield in the United Provinces on account of the length of growing season required. You must have a cotton producing fruiting branches early. There is too short a season in the United Provinces for anything requiring prolonged growth. Other factors in regard to yield are purely climatic. For instance, three years ago I got a yield of thirteen maunds an acre from K. 22. On exactly the same land, I got 1½ maunds an acre this year. This was due purely to excessive rain. Rain affects the yield in two very distinct ways. In the case of the irrigated cotton, you get germination before the rains. The young plant is formed and sends down its roots. If there is heavy rain when the plants are still small, you get water-logging conditions throughout the region occupied by the roots of the cotton. If that condition persists for any appreciable length of time, the plants get so sickly that they never recover. This is probably more marked in American than in *deshi* though I have not studied this development for want of time. The other case is that of a good plant in fruit. You then get a week's heavy rain with cloudy weather. For some reason, which I am unable to dogmatize about the whole fruit falls. After heavy rain for a week recently, the bolls, both nearly mature and young ones, fell off at the junction with the stem. This shedding is not due to the rise in the water table in the United Provinces, whatever may be the case in Egypt. Continuous rain in the flowering period causes falling off in the rate of flowering and the flowers that do develop are much more likely to fall off. I am doubtful if the flowering period of American is longer than that of *deshi* in the United Provinces. The exact meaning of the term 'flowering period' is not always understood. A plant can only produce a certain amount of fruits—that is, it is capable of producing food material sufficient for ripening off a limited number of seeds only. As soon as that number of seeds has been formed, flowering will cease. The length of time the plant goes on flowering therefore depends on the season. *Deshi* plants start flowering again after the flowers have been knocked off by rain. There is thus a certain correlation between rainfall and the length of the flowering period but I cannot give details. I have not studied the difference between *deshi* and American from this standpoint. *Deshi* has, however, one characteristic which enables it to stand heavy rainfall better than American, *viz.*, that it is not so leafy a plant as American. Owing to the spread of leaf in American, there is too much shade and the atmosphere round the plant in a moist climate is much more moist and therefore unfavourable to flowering. If you sow American and *deshi* at the same time, the *deshi* commences flowering before the American and will thus have been flowering for a much greater period than the American at the time when rain comes. Consequently it exposes much more fruit to damage. For this reason, American may be more resistant to rain in the Punjab. If you get *deshi* cotton of an inch and an American cotton of an inch in staple, it is for the spinner to say which of the two will spin the higher counts. The fibre of *deshi* cotton is thicker than that of American except in the case of *Hinganghats.*

143. The only way to control the distribution of seed is to start with a central farm from which you send out seed to certain areas which will in their turn pass it on to others. The central farm should be under strict control. It should supply seed to co-operative societies which would supply areas outside. The societies should not grow the seed of the crop they produce but should pass it on to areas outside, getting fresh supplies from the farms. A crop, unless put out like this, would lose its character in about three or four years from the botanical point of view even when such factors in producing impurity as the mixing of seed in the gins are excluded. Most American seed is not pure to start with. The danger is from cross fertilization and you get the same problem with American as with *deshi* once you try to replace a low grade American by a better type. I cannot imagine any climatic conditions in which K. 22 would be likely to deteriorate in quality of lint as it has been raised under climatic conditions which are all against quality. The problem has to be studied by tracts. I lay great stress on yield tests before cotton is finally put out. The trouble about yield tests is the variation from year to year. It is difficult to know what an average year is.

144. I have not worked on American cotton as I have on *deshi* cotton. One reason for this is that American types have too long a season. I am not prepared to say that work on American types is likely to prove fruitless but it is not so likely to yield good results as work on *deshi.*

145. The present custom of the market is simply to buy on ginning percentage without much regard to staple. The only way to improve matters is to eliminate the middlemen. Last year, I put out fifty maunds of K. 22 seed round my farm at Kalai in the Aligarh district and I made private arrangements with a Cawnpore Mill-owner to send up men there to buy up the *kapas*. Unfortunately owing to continuous rain, including seventeen inches in one day, the crop was spoilt. For a bigger crop, an organized body is necessary.

146. (*President*).—Government sales are only a temporary arrangement. The mill-owners must start an organization. Some one must be prepared to drop money in bad years. The mill people can assist us a great deal. The Cawnpore merchants are quite sympathetic; they are quite prepared to do all that they can but there is no assurance of continuity. Improved cotton will not be established naturally in bulk. There must be assistance from the trade in the earlier and intermediate stages. My concern is with the production

of improved cotton rather than with its production on a commercial scale. A crop that does not cross fertilize can be handed over for multiplication much earlier. In order to get out cotton in sufficient bulk with a sufficient standard of purity, I have a farm at Kalai. My research station is at Nawabganj. Seed is taken from there to Kalai where fifty acres are under cotton. Pure seed is issued from Kalai which is the multiplication centre. I am satisfied if the seed issued from Kalai is pure and I do not follow up the crop after it has left Kalai. In any system of seed distribution such a farm as Kalai is a most important stage.

[illegible]

measure in the reorganization. The Deputy Director has charge of the experimental farm at Cawnpore at the present time. The appointment of an Agriculturist for the College has been sanctioned but he has not yet been recruited.

150. My impression is that fluctuations in yield are so great from year to year that the cultivator is unable to appreciate the relative yields of *kapas*. I think that in work on cotton it is possible to avoid big mistakes without detailed experiment. It is on such general considerations and not on experimental results that [illegible]

The Hon'ble Rai Bahadur LALA JANKI PRASAD, Khurja, Bulandshahr.

EXAMINED AT CAWNPORE, NOVEMBER 5TH, 1917.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

(a) *Deshi short staple cotton.*

152. (1) **Experience.**—I have lived in Khurja district Bulandshahr since my birth. I have ginning and pressing factories at Khurja, Hapur, Rohtak (the Punjab) and Chandausi (Moradabad District). As I am a landlord, I often come in contact with the cultivators.

153. (2) **Varieties.**—There are two kinds of *deshi* cotton—yellow flowered cotton and white flowered cotton.

154. (3) **Size of holdings.**—The cultivator who holds forty *kachha bighas* or thirteen *pukka bighas* or eight acres of land uses one fifth or one sixth of it for growing cotton.

155. (4) **Yields and profits.**—The average of the cotton produce is six or seven maunds per acre. Deducting husbandry expenses and rent at the rate of Rs. 3-8-0 per maund, the net income is Rs. 3-8-0 per maund.

[illegible] only one crop [illegible] refore [illegible] long [illegible] ate in [illegible] ce the farmers to grow it.

159. (8) **Uses of seed and seed selection.**—In these districts cotton seed is used for feeding cattle [illegible] Hand [illegible]

161. *General.*—In my opinion yield from the long staple cotton can be greater to the cultivators than that from any other variety, because its rates are higher. Good cotton can be had from good raw cotton

and it fetches higher prices, but in India people follow old methods and pay little heed to progressive ones. If landlords induce their tenants to take heed to growing long staple cotton, much improvement can be expected. Cotton grown at present can be spun *into counts 10's or 12's only*. *In order to spin* counts of better quality, cotton is sent for from Akola, Khamgaon and Ujjain, etc. If the cotton of this sort begins to grow in this Province too, the cultivators can be more benefited, because to the market value obtaining in those places the transit charges can *also* be added and thus will be paid at a higher rate here.

II.—Commercial Aspect.

162. (30) **Local trade customs.**—In every district, there are some cotton markets where the customers buy cotton through the *aratyas* (brokers). Either the cultivators themselves or the *beoparies* bring cotton to the shops of the *aratyas*. These *beoparies* are the people who go to the villages and buy raw cotton from the cultivators. Future contracts are not made here as in Rajputana and the Punjab.

163. (31) **Standardization of commercial names.**—There is no commercial name *given to cotton*. Of course, the outturn of cotton of every place is different—from sixteen seers to eleven seers. Rates are fixed according to the outturn. With regard to the outturn, cotton is named '*kalon*.' The names of cotton staples are (1) good, (2) fully good, (3) fine, and (4) superfine, and these names are popular everywhere. The 'superfine' is considered to be the best.

164. (32) **Buying agencies.**—If cotton purchase be made through co-operative societies, there can be an improvement in its quality.

III.—Statistical.

165. (33) **Improvement of cotton forecast.**—In my opinion the present method is satisfactory. Only so much change is required that the forecasts should be published as soon as possible. It would be better if they are published in the month of August before the cotton season, so that *the traders may make the best use of them.*

166. (34) **Improvement of other statistical information.**—The present way is quite satisfactory.

167. (35) **Publication of Liverpool and Bombay Prices.**—*The cotton rates of* Bombay and Liverpool markets must be published in upcountry markets.

IV.—Manufacture.

(a) *Ginning and Pressing.*

168. (36) **Type and number of gins and presses.**—I have *in my factories gins* by Platt Brothers and presses by Nasmyth Wilson. The number of gins in our factories is as follows:—

Khurja.	Hapur.	Rohtak.	Chandausi.
100	88	44	50

169. (37) **Size of bale.**—Each bale produced by our factories is 49 inches long, 19 inches wide and 17 inches thick.

170. (38) **Saw gins *versus* roller gins.**—Roller *gins are preferred to saw gins*.

171. (39) **Effect of saw gins on Indian cotton.**—The staple of Indian cotton is spoiled in saw gins and therefore the gins of this kind have proved *a failure*.

172. (40) **Factory labour.**—We often experience difficulty in obtaining factory labour.

173. (41) **Conditions of cotton.**—Certainly, cotton of bad quality often finds its way into factories the remedy for which I have *suggested in paragraph* 164 above.

174. (42) **Effect of replacement of short staple cotton by long staple.**—To gin long staple cotton, an alteration will have to be made in that *mechanism which sifts* seed from cotton.

V.—General.

175. (46) **Attitude of buyers to *improved* cottons.**—I have never seen any cotton purchaser advancing money to the cultivators in order to encourage the growing of cotton of a good quality.

VI.—Irrigation.

176. (66) **Watering of cotton.**—Cotton fields are irrigated for the first time towards the end of April or in the beginning of May. They are watered three or four times. The first instalment of water reaches the height of three inches and others that of four or five inches.

177. (67) **Cotton *versus* wheat.**—Wheat is preferred to cotton. Cotton is grown in rainy season and therefore there is always a danger of its being *damaged* on account of heavy rains, while wheat is grown in winter and hence there is less danger of its being injured.

178. (72) **Adequacy of supplies to increase in area.**—Cultivators do not like irrigation under canals as they do not get water in time.

179. (73) **Deshi *versus* American cotton.**—American cotton is not given preference to *deshi* cotton only, because if it (American cotton) be sown, only one crop can be reaped in a year. Besides this, it needs more water.

The Hon'ble Rai Bahadur LALA JANKI PRASAD, called and examined.

(*Translation.*)

180. (*President.*) I have never bought Aligarh white flowered cotton. The ginning percentage is good and so is the quality and the colour but the staple is very *short*. Bulandshahr is between Aligarh and Meerut. I have had no experience of Cawnpore American cotton. I do not use American cotton in my mills. This cotton cannot be procured in sufficient quantities. On one occasion, the Agricultural Department sent their cotton to me for ginning and they took away the seed and the ginned cotton. It was *deshi* cotton but I am not sure whether it was the Aligarh white flowered cotton or not. This cotton was bought by the Agricultural Department from the cultivators to whom they had sold the seed. The Agricultural Depart-

not sell the cotton

y it at Akola and
le *cotton grown*
They are quite
ignorant people They only look to high ginning percentage and must be forced to take it up by the

when cultivating American

182 As to the present cotton forecasts they seem to me to be suitable but I think that it might be better if they were printed in the vernacular The forecasts should be printed earlier and should be issued monthly Returns are at present only taken from cotton presses and not from gins because the only check is what goes to Bombay and that goes from the presses Returns should be obtained from both gins and

be sent in
en in my
as soon
be made
compulsory and they should be printed in the vernacular

183 I think that the Bombay and Liverpool prices should be published I get Bombay prices daily. If Bombay and Liverpool prices are published, the commission agents will get to know them and they will inform the cultivators

ton on its
is no use
That is
ing com
try The
or counts

185 (*Mr Roberts*) I have no experience of Cawnpore American cotton I have spun up to 24s I know nothing about American I prefer roller gins to saw gins I put up sixteen saw gins at *Hathras*

where there is a pool, payment to it is made on the basis of one and a half times more for the double roller gin than for the single roller gin

186. (*President*) I am in favour of extending tube wells

Mr. TEWARI RAM GHULAM, Zamindar, Honorary Magistrate and Member, District Board, Kodarkot.

Examined at Cawnpore November 5th, 1917.

Written statement

I —Agricultural Experience.

(a) "*Deshi*" *short staple cotton*

187 (1) Experience —I am an inhabitant of Kodarkot, Tahsil Badona District Etawah

188 (2) Varieties —In my district generally, white flowered *deshi* and yellow red flowered varieties of cotton are grown In my tract I introduced the white flowered Aligarh variety, the seed of which I

obtained from the Agricultural Department. This was introduced in the neighbouring agricultural area but mostly the Malwa variety is sown. Formerly more than one-third of the area used to be under cotton but for the last two years indigo has been grown on a large scale and this has reduced the area under cotton by less than one-third.

189. (4) **Yields and profits.**—The average outturn per acre is seven maunds and profit Rs. 20 per acre.

190. (5) **Rotations and manures.**—The fields commanded by the canal are sown with gram if they are watered at the proper time. The scarcity of water is generally complained of by the cultivators and most of the land in the canal irrigated tracts is left unsown and comparatively less land is brought under sugarcane after cotton is harvested. Manure is scarce in the village. [illegible] (cattle dung) is used as a manure.

191. (6) **Rotations and manures.**—I obtained seed from the Agricultural Department and introduced it in my village. Its average production is comparatively more than the *deshi* seed which is generally sown in the district.

192. (7) **Conditions affecting increase in area.**—Twenty years ago, there were many indigo factories in the district and cotton was sown in a smaller area. With the closing of indigo factories, a larger area was sown with cotton. The last two or three years have again seen indigo factories revived and with the fall in the price of cotton, the area under cotton has again gone down. In order to secure an increase in the area under cotton, I would suggest the following steps:—

(i) The cultivators should get a good price for their produce.
(ii) Their *kapas* should be purchased in their villages.
(iii) They should get selected and cheap seed at the proper time.
(iv) There should be gins in every *tahsil*.
(v) The cultivators should be liberated from dealers with [illegible] to whom they now sell their *kapas*.
(vi) In the areas commanded by canals, every effort should be made to give water for the sowing of *kapas* at the proper time.
(vii) The water rates should be reduced.
(viii) The land revenue assessed on cotton should be reduced.
(ix) Government agricultural farms should be established in each *tahsil* with seed depots attached to each of them and thus selected seed of good variety should be made available to cultivators.

193. (8) **Uses of seed and selection.**—Oil is extracted from cotton seed. Traders generally adulterate this oil with ghee. The cake made from the seed is used as cattle fodder. There is no system of selection. Cultivators generally sow hand ginned seed. Traders who buy cotton for the gin in the market generally damp it with water so as to increase its weight. Seed is generally cut in the process of ginning in factories and on account of its being damped, it becomes spoiled. The cultivator does not buy such seed as it does not germinate well.

194. (9) **General economic conditions.**—Students should be given agricultural education in village schools. Big *zamindars* should start demonstration farms on their land.

(b) "*Deshi*" *long staple cotton.*

195. (11) **Varieties.**—Long staple cotton is, I think, not sown in this district. In the current year I got thirty maunds of seed of K. 22 cotton from the Agricultural Department and had it sown in my village. On account of heavy rain, no correct estimate can be formed of its production. Its staple, of course, is long and fine.

196. (15) **Conditions affecting increase in area.**—I have already given my views in paragraph 192 above as to the improvement of cotton. The Agricultural Department should select seed of fine stapled variety out of the *deshi kapas* according to season. The seed should be multiplied. Selected seed should be sown on the demonstration farms started by *zamindars*. In this way, the cultivators can get seed easily.

197. (17) **Prevention of mixing of different varieties.**—The big *zamindars* should sow long, short and exotic cottons on their fields separately, sell the out-turn separately and gin each variety separately in a separate gin. In this way a profitable variety can be evolved, and the cultivators will abstain from mixing seeds.

(c) *Exotic cotton.*

198. (21) **Varieties.**—Cawnpore-American cotton is the only variety grown. The area of this in my district is very small.

199. (23) **Comparative returns.**—The production of this cotton round my village has been small as compared with that of long and short stapled *deshi* cotton for the following reasons.

(i) Greater harm is done to *kapas* of American cotton by rain than to *deshi kapas*.
(ii) American cotton cannot stand dry weather in comparison with *deshi*.
(iii) American *kapas* occupies the field for a longer period than *deshi* does. In this way, the chances of sowing other crops are minimised.
(iv) As far as I know, the cultivators sold American *kapas* to dealers who in their turn sold it to Government. The cultivator's profit was in this way reduced by one-third, *i.e.*, he got a profit of Rs. 13 per acre.

200. (25) **Conditions affecting increase in area.**—American cotton can be extended in this district if its price be increased by 25 per cent. and arrangements for purchases be made at the cultivator's place and a sufficient supply of water from the canals be allowed at the proper time.

201. (26) **Suitability of existing varieties.**—Experiments have shown that American cotton does not suit my district. These two divisions of my district are known as *ghar* and *pachar*. There is always scarcity of water in *ghar*. American cotton cannot be sown in the district at the proper time. In *pachar*, American cannot stand heavy rain. In both cases, American does not do well.

II.—Commercial Aspect.

202. (30) **Local trade customs.**—The cultivators take their *kapas* to the markets nearest to the villages and sell it to the ordinary dealers, who take it to Etawah and sell it there. There is no system of contract.

203 (31) **Standardization of commercial names**—In my district *kapas* is known under the name of *ghar* i e, *kapas* which grows across the Jumna and (2) *pachar*, i e, *kapas* grown in the Eastern portion of the Etawah District. *Ghar kapas* is comparatively better than *pachar kapas* and obtains a better price.

will

t the

III—Statistical.

205 (33) **Improvement of cotton forecast**—Forecasts are not generally accurate as they cover a wide area. If the forecasts can be compiled for smaller tracts, they would be useful.

206. (35) **Publication of Liverpool and Bombay prices**—It would be very useful to publish daily the cotton prices of other countries in the districts, where cotton is abundantly grown, to facilitate the farmers, in disposing of their produce profitably

V.—General.

207 (48) **Desirability of alteration in water rates**—The following complaints of which I am aware of have been made by cultivators in regard to water rates —

watering should only be made.

In such circumstances, the cultivators cannot improve their fields and cannot apply manures to it.

VI—Irrigation

208. *General*—The crop is injured for want of canal water supply at the proper time It appears canal water is not sufficient to irrigate the present areas If the first watering is given the second supply fails—which leads to failure of crops. Many difficulties arise especially where the water distributaries end If water cannot be provided for the cultivation of cotton in those tracts the cultivators are deprived of sowing cotton.

209 (66) **Watering of cotton**—The cotton is sown in the month of May and June after first watering In canal irrigated tracts two waterings are given if the rainfall is late and if it is in time only one watering is given In the case of no rainfall several waterings have to be given though I cannot say what volume of water is necessary

210 (67) **Cotton *versus* wheat**—As timely water supply is uncertain the cultivators prefer to sow wheat instead of cotton. Besides this they sow *juar* first and follow it with wheat

211 (68) **Wells and tube wells**—Where canals and wells both exist the cultivators prefer to utilize canal water for the sake of convenience but at the end of distributaries where the water supply is insuffi

suitable to grow *kharif*

ter from wells With

eld of the area becomes

naturally induced to

sow next year the crop which obtains a better price in the current year, extensively without any rhyme or reason

vicinity because it is sown earlier than the *deshi* and requires more water, is destroyed by excessive rainfall

ultivators

less than

n the year

Mr. Tewari Ram Ghulam called and examined.

216 (*Mr Roberts*) I come from Etawah District in which I am a *zamindar* I have grown American cotton on my land both this year and last year Owing to the rain both (this year and last year, it has proved a failure I sold my American *kapas* at a premium of Re 1 to Rs 1 8 0 per standard maund over the price of ordinary *deshi* The farm overseer at Etawah purchased the *kapas* Etawah is 24 miles

from my village. I have sold both Aligarh white flowered cotton and American. I derived a greater profit from the latter. I sold my Aligarh white flowered at Rs. 8 and Rs. 9. The outturn of the Aligarh white flowered is greater. I sold my Aligarh white flowered in the usual way without any premium. The yield per acre of the Aligarh white flowered is larger than that of *deshi* but the price is the same. Last year we did do any business with American. The cultivators do not like this cotton. Aligarh white flowered is a bigger yielder than *deshi* but I do not know the amount of the difference. If the cultivators were to get a premium of Rs. 3 per maund for American, if they were to get water from the canals in proper time and if the cotton were grown in larger quantities, then it would prove profitable. In the districts, the people are frightened of buying it because they consider that it is a Government cotton and that they might be punished if they bought it as Government have bought all the crop up to the present.

217. (*Mr. Ashton.*) I have stated in my written evidence that, in my judgment, the water rate on American cotton should be reduced. The present rate is ten annas and twenty annas per *pukka bigha.* My opinion is that the *zamindars* should reduce the rent they take from the cultivators. There is less supply of water available from the canals than there used to be. We do not get water at the proper time. We do not get it when we want it, *i.e.*, we do not get it early enough for the first watering or late enough for the second watering. The first watering is in May and the second watering, if there is no monsoon, is in June. The water rate is the same for all varieties of cotton. I should like to mention, as an example, the case of wheat this year. It has been announced that water rates have been reduced and there has consequently been a large increase of area of cultivation under wheat. If the water rate for American cotton were also reduced, there would probably be an increase in the area under it. Irrigation is recorded by the Patrol *Amins.* Their pay is from Rs. 7 to Rs. 8 per month. The work of the Patrol *Amins* is checked by the superior officers and there can be no hesitation in trusting them. American cotton is more susceptible to damage by rainfall than *deshi.*

Mr. NARAIN PRASAD KURMI, Zamindar, Macha, Cawnpore District.

Examined at Cawnpore, November 5th, 1917.

Written statement (Translation).

I.—Agricultural Experience.

(a) "Deshi" short staple cotton.

218. (1) **Experience.**—I am a resident of Cawnpore. I have all along been in this province and have also come in contact with many other cultivators.

219. (2) **Varieties.**—The varieties of *deshi* cotton grown in this province are white flowered as well as broad and narrow leaved. They are often mixed. No pure variety is sown by cultivators in general. It is two years since the cultivators began to sow the Aligarh White Flowered seed, which they get from the Agricultural Department. It is liked by the cultivators on account of its thick growth and heavy lint.

220. (3) **Size of holdings.**—About one quarter of the cultivators' land was under cotton a few years ago, but the abundance of grass in the field and difficulty in procuring labour for weeding have reduced it to one-sixth. The average area under cotton at present in each holding is not more than 1½ to two acres in all. An increase or decrease in the cotton cultivation is partly due to the gain or loss of the farmer from the previous year's cultivation and partly to the increase or decrease in canal water. In the case of those who sow cotton in the beginning of the rains, the percentage of sowing largely depends on the nature of the monsoon, *i.e.*, if the rains continue incessantly at the sowing time, the percentage of the acreage under cotton is decreased.

221. (4) **Yields and profits.**—Three years ago when the climatic conditions were suitable, the produce varied from five to seven maunds per acre, but now their unsuitability has reduced the produce to two maunds per acre. Here the crop being generally sown mixed with pulses and oilseeds, the cultivator is able to get a profit of Rs. 15 to Rs. 20 per acre, to meet his expenses.

222. (5) **Rotations and manures.**—Peas are sown after cotton. Cotton is generally sown in the fields of *bajra* and gram and no manures are applied.

223. (8) **Uses of seed and seed selection.**—The reason why seed is not found in any great quantity with the cultivators is that they dispose of the unginned cotton, and, in the sowing season, purchase it either from the bazaar or from the ginning factories, for the machine ginned seed is held to be better than the hand ginned seed. But a few clever cultivators who know that the machine ginned seed is partly cut down and at the same time is parched by the heat of the machine and that thus its germinating power is decreased, preserve a small quantity of cotton and gin it in the *churka* to get pure seed for sowing. Seed is purchased from the bazaar for feeding cattle, but it is never used for oil seed in this province. Cultivators here are not accustomed to select good seed for sowing.

224. *General.*—If the cultivation of the Aligarh White Flowered short stapled cotton is extended in this province, the existing mixed inferior quality will soon vanish, as the former variety is better in growth and quality.

(c) Exotic cotton.

225. (21) **Varieties.**—The Agricultural Department has been encouraging the extension of exotic cotton for the last three or four years, but no great success has been achieved, because the area under this cotton is still comparatively very small. In spite of its produce being nearly the same as that of *deshi,* the area under its cultivation has never exceeded three thousand acres in all in this district.

226. (25) **Conditions affecting increase in area.**—Ever since its spread the climatic conditions have not been favourable and therefore the cultivators could not hold a good opinion of it.

(2) There are some other causes which hinder the spread of this cotton. They are the following:—

(1) There is a lack of water for irrigating the crop in the month of May, without which it proves a failure.

(2) The crop remains longer on the ground than *deshi* and thus in *rabi,* peas, etc., cannot be sown.

(3) The American cotton suffers more from boll-worm than *deshi.*

(4) The difference in the price of long and short stapled cotton is not sufficient. It is only one rupee per maund and this goes away in ginning, etc.

(5) Other crops, such as pulses, can also be grown in *deshi* cotton because its plant is not of great height

(3) The experience of the last two or three years shows that if there can be any extension of Cawnpore American, it can be only in the following ways —

(1) The Canal Department should take an interest like that of the Agricultural Department in

(3) Cultivators of American cotton should be given some advances for two or three years to grow this variety as is done by the Opium Department

(4) Th

(4) The best seed of a variety of long stapled cotton, which does not remain longer in the field than *deshi* should be distributed to the cultivators at reasonable rates at different farms, which should be opened at different places. The present system of distribution is very defective

(5) The price paid for the long stapled variety is too small and should be considerably increased

II —Commercial Aspect.

There are two sorts of buyers who purchase cotton from the village ... who ... In the ... mixing ... pur ... cultivators ... encouraged ... quan ... spoiling our cotton.

Mr Narain Prasad Kurmi, called and examined

help. It gave me implements and also seed.

Mr. CHIRANJI LAL BAGLA; Zamindar, Honorary Magistrate and Chairman, Municipal Board, Hathras.

Examined at Cawnpore, November 5th, 1917

Written statement

I.—Agricultural Experience

(a) "Deshi" short staple cotton

229 (1) Experience —I reside at Hathras, Aligarh District, and have an experience of cotton of about fifteen years. Being a *zamindar* I have been in actual touch with cotton cultivators.

230 (2) Varieties —There are two kinds of *deshi* short staple cotton, generally known by the name of yellow and white flowered. They contain two sorts of staple, rough and silky

231. (3) Size of holdings —A cultivator who holds about eight acres of land, usually reserves one-fifth or one sixth part for the purpose of cotton sowing

232 (4) Yields and profits.—The production of raw cotton is about six or seven maunds per acre. The net profit to the cultivator is estimated at about Rs 25.

233 (5) Rotations and manures —Fields of *deshi* short staple cotton are resown with barley, *chaina* and peas, and hence the cultivators prefer *deshi* short staple cotton to American because the latter cannot be followed by another crop The manure generally used consists of rubbish and cowdung

cotton in our tract are not great In the case of any possibility ... would limit that increase.

236. (8) **Uses of seed and seed selection.**—Cotton seed in our side is generally used as fodder but to some extent elsewhere oil is also extracted out of it. Its refuse (*khal*) is used as manure. Seed is selected for the purpose of sowing. The seed which has blue colour, a round shape and contains a yellow kernel (*migi*) is preferred. Hand ginned seeds are used for sowing.

237. (9) **General economic conditions.**—There is little or no hope that any improvement can be anticipated from the cultivators as they are generally uneducated and, therefore, I am of opinion that by the aid of the *zamindars*, good seed should be provided to the cultivators in order to obtain fine quality of raw cotton. They may also be requested to supervise manuring.

II.—Commercial Aspect.

238. (30) **Local trade customs.**—There are cotton markets called *mandis* in every district where customers, both cultivators and others, import their raw cotton to a shop-keeper called *aratya* for sale and wherefrom the cotton merchants buy it for the purpose of ginning and pressing. There is no future contract system as is in Rajputana and the Punjab.

239. (31) **Standardization of commercial names.**—Raw cotton does not bear any commercial name here. Raw cotton coming from certain villages has different outturn ranging from eleven seers to sixteen seers, but in general the outturn is estimated at one-third of a maund and the value of it is fixed and paid on the outturn and is known in the market by the name of the village from which it comes.

240. (32) **Buying agencies.**—For the purpose of buying agency, I would recommend the establishment of co-operative societies at each centre of raw cotton-growing areas which would greatly improve the quality.

III.—Statistical.

241. (33) **Improvement of cotton forecast.**—I would recommend that publication of the forecast may be done in each district monthly indicating therein the condition of the crop. It should be published at an early date before the cotton season commences. The public would be much benefited if it could be published in Hindi as well.

242. (34) **Improvement of other statistical information.**—The present system of obtaining statistical informations from factories appears to be quite sufficient.

243. (35) **Publication of Liverpool and Bombay prices.**—I am in favour that the Liverpool and Bombay cotton prices should be published in upcountry markets.

IV.—Manufacture.

(a) *Ginning and Pressing.*

244. (36) **Type and number of gins and presses.**—I use single gins made by Platt Brothers and a press by Nasmyth Wilson & Co., Ltd. The details of factories and presses are given below:—

Hathras (Two factories)	80 and 40 gins.
Hardnagunj	30 gins
Hathras	Spinning Mills
Do.	Press.
Cawnpore	Press.

In addition to this, I am a shareholder in ginning and pressing factories at Kurja, Hapur, Chandausi and Rohtak.

245. (37) **Size of bale.**—The length of the bale is 49 inches, width 20 inches and thickness 17½ inches.

246. (38) **Saw gins *versus* roller gins.**—On our side we prefer roller gins as the saw gins spoil the staple. Saw gins had not been successful here. There were sixteen which were replaced by roller gins.

247. (41) **Condition of cotton.**—Bad qualities of raw cotton do come in the factories and the remedy I have pointed out in paragraph 240 above.

(b) *Spinning and Weaving.*

248. (43) **Counts spun and market.**—Generally our factory spins counts 10½s to 14½s and, in case of demand of lower and higher counts are also spun, ranging from 6½s downwards to 34s upwards.

249. (44) **Condition of cotton.**—Cotton of bad quality admittedly comes to the factories and if the remedy suggested in paragraph 240 above be adopted, the defect at present will surely be removed.

V.—General.

250. (46) **Allotment of buyers to improved cotton.**—In my experience, the buyers in the past have not offered a premium to encourage the growth of improved cotton.

VI.—Irrigation.

251. (66) **Watering of cotton.**—First watering is done at the end of April or beginning of May. It is about three inches and generally three or four waterings are required ranging from four to five inches.

252. (68) **Cotton *versus* wheat.**—Cultivators prefer wheat to cotton because the former is sown in the winter season when there is no fear of its being damaged by excessive rain whereas raw cotton is sown in the rainy season and there is every fear of its being damaged by excessive rain.

253. (72) **Adequacy of supply to increase in area.**—Owing to scarcity of water in canals, cultivators find much difficulty in getting sufficient quantity of water in time.

254. (73) **"Deshi" *versus* American cotton.**—*Deshi* raw cotton is followed by another crop of barley, *chaina* and peas while the American one gives no such advantage. Generally cultivators look to their present immediate gain, and are not willing to wait.

Mr Chiranji Lal Bagla called and examined

(*Translation*)

255 (*President*) I know Aligarh White Flowered cotton. The staple and quality are good but the ginning percentage is poor The outturn of [illegible] good because the seed there is selected seed sow selected seed and their outturn is therefc [illegible]

back the best seed to the cultivators

257 The publication of Liverpool and Bombay prices in upcountry markets would be useful At

the commission agents and if the prices are posted up these *zamindars* or commission agents will work out the ginning percentage and in consequence the price of *kapas* Of course all the cultivators would not be able to work out the price of *kapas* from the rates and it would therefore be useful to the cultivator if he could get the price of *kapas* worked out when the rates were posted up in the market As the outturn of *rui* (ginned cotton) varies it would be difficult for Government when putting up the price of lint to put up the proper price for *kapas* as well In these circumstances it is doubtful if the publication of prices would be of much use to cultivators

258 I buy most of my cotton in the United Provinces It is all *deshi* I spin mostly 12½s to 20s. I spin some cotton up to 34s with cotton that I buy from Broach I have 120 gins at Hathras I also own a spinning mill there I gin my own *kapas* In the beginning of the season wet *kapas* comes to the factory which I get dried When I get damp *kapas* I make an allowance for it in the rates

[illegible] of dampness in the cotton If I get [illegible] day, then the [illegible] always get it [illegible] t resorted to

[illegible] on of the cart load [illegible] es according to the [illegible] an allowance for [illegible] *kapas*, do their own [illegible] t do any purchasing business, they only gin on commission and charge their ginning charges I think that we can only stop this mixing by co operative societies buying the cotton and selling the *rui* themselves

261 (*Mr Henderson*) I am a member of the Aligarh Co operative Society If Government distributed seed to co operative societies they would distribute it to cultivators My co operative society has not distributed any seed It was established in 1913 The Agricultural Department is already helping [illegible] Depart[illegible] vators [illegible] in the [illegible] favour [illegible] d take advantage of them

262 (*Mr Roberts*) I would like to see longer staple cotton grown At present I find it difficult

[illegible] American cotton [illegible]

imported fifteen saw gins. He has four left which [illegible]

roller gins.
paid for single roller gins.

Thakur NIRANJAN SINGH, Zamindar, Mahmoodpur, United Provinces.

THIS WITNESS WAS NOT ORALLY EXAMINED.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

(a) and (b) "Deshi" cotton.

265. **(2) Varieties.**—In the districts of Aligarh and Etah (United Provinces) in which I know something of cotton cultivation, white flowered cotton mixed with yellow flowered was mostly sown formerly. Thereafter some people began to sow white flowered cotton separately and it was called [illegible]. [illegible] cotton being richer in *rui* was given preference by the Agricultural Department, and on account of this virtue, a higher price was offered for it. The *banias* also were willing to take it at an increased price, and thus it became popular with the cultivators, and now white flowered cotton is seen in the field almost everywhere.

266. **(3) Rotations and manures.**—As the *deshi* cotton crop ends before winter, barley and peas can be grown easily for a second crop. Sometimes ordinary manure is made use of, but it is not generally so, nor is it necessary. *Deshi* cotton surpasses American and *buri* cotton in produce; also the former requires less labour and time comparatively.

267. **(7) Conditions affecting increase in area.**—In the recent years the cotton area has extended. The reasons for this are as follows:—

(i) Before this time indigo was the predominant agricultural industry and it was [illegible] supplanted by artificial indigo.

(ii) The sugarcane industry has been suppressed by foreign sugar. Scarcity of cane and [illegible] have also been among the causes of its decline.

(2) Now the only thing left to the cultivator as a source of income was cotton. But for the last two years both sugarcane and indigo have revived slightly, and they have to some extent proved rivals to cotton. Indigo is more desirable, as it is more profitable, being an early product, and it gives strength to the next crop, wheat, etc.

268. **(8) Uses of seed and seed selection.**—Cotton seed is used for feeding cattle and it is also transported for the same purpose; perhaps it might be used for oil also. No selection of seed in particular is made. Ordinarily, the cultivator keeps apart the best bloomed cotton, and its hand ginned seed is used for sowing. This seed is preferable to factory ginned seed.

(2) Cotton is usually sold wet and the *banias* collect it in heaps without exposing it to the sun; this spoils the seed and the fibre, and the former is also rendered unfit for sowing on account of its internal heat and want of air. The cotton left to dry well before it is collected in heaps will give the best seed even if factory ginned. I say this from my own personal experience.

(c) Exotic cotton.

269. **(20) Experience.**—I have been personally in contact with cotton cultivation, both with my own cultivation and that of my neighbours and peasantry in my villages in the districts of Etah and Aligarh, for the last fifteen years.

270. **(21) Varieties.**—American cotton used to be almost equal to the produce of that of *deshi* cotton. As long as the Agricultural Department guaranteed to purchase the produce, the cultivators gladly used to sow it, also because the price offered was somewhat higher than that for *deshi* cotton. All of a sudden, the Department refused to purchase it in the year in which it was sown on a very large scale. Also it did not undertake any other measure to get it sold otherwise for the cultivators. This gave a very great shock to the cultivators and they got very discontented and disappointed. As it was not so rich in *rui* as *deshi* cotton, the *banias* were not slow to take advantage. They offered a low price and succeeded in getting it at that price. Since then, it has practically been put a stop to.

(2) In this quarter, it was myself alone who continued it. I used to sell it mixing it with *deshi* cotton. Meanwhile, seed selection was also made. Some years later, the Department again felt the necessity and took up the question of its cultivation. I was requested to supply cotton for seed. The cotton supplied by me gave satisfaction to the Department. It was given the name of Mahmoodpur American cotton. The cultivators were requested to cultivate it and some of them acceded to the request.

(3) After that Dr. A. E. Parr recommended to me *buri* cotton and asked me to try the experiment. Accordingly, it was sown in an acre or two and its produce proved more profitable than *deshi* cotton. That year cultivators of the vicinity saw it in the field, and the Director of the Agricultural Department, accompanied by the Deputy Director, also travelled to visit the spot and expressed their satisfaction. Next year, cultivators too tried it and its produce, though not so good as that of the former year, on the whole was successful. In the third year, it was attacked by a disease (leaf-roller) and it badly affected its produce. Thenceforward, the disease has continued and has lessened the produce. For the last two years, *buri* has greatly declined, and it is due partly to this disease and partly to abundance of rainfall. American cotton was stopped for danger of its being mixed with *buri*. I hold that the crop will be successful in a dry season and that lateness and abundance of rain will destroy it. It was only one year that *buri* surpassed *deshi* cotton in produce, otherwise it has never equalled *deshi*. After *buri* or American cotton, nothing can be sown for the *rabi* (winter) as the picking season lasts so long.

271. **(24) Rotations and manures.**—In my opinion, no manure is required for *buri*. The experiment shows that the crop in a manured field was attacked by disease more severely. It is found that this crop is very successful in a field which has yielded one other crop with manure previously.

272. **(25) Conditions affecting increase in area.**—*Deshi* cotton is largely liked for the reason that it is sown at the middle of *Jaith* (May-June) whilst *buri* is sown at the middle of *Chait* (March-April). During the two months of summer, labour and water supply are very much needed. Secondly, *deshi* cotton picking is finished before winter and *buri* continues to bloom through winter. In this way the expenses of its picking and watching have to be borne for two months more. Even then its produce does not equal that of *deshi*.

(2) *Deshi* cotton allows barley and peas for the second crop which is not possible in the case of the other. The disadvantages are not amply made up for by the *nominal* increase in price granted in the case of *buri* Cotton by the Department. Moreover, the way in which it is purchased is not favourable.

273. (27) **Prevention of mixing of different varieties**—I do not think that American cotton is sown mixed with *deshi*. When the cultivators feel inconvenience in selling the former pure they resort

[illegible]

seed will be saved from being injured and *rui* being spoiled

274. (28) [illegible] is probable it [illegible] mplaint in the [illegible] arrangements [illegible] oduced Sym [illegible] those dealing [illegible]

rainfall, while the crop on low land fields have utterly failed

VI.—Irrigation.

276. [illegible] by the Upper Ganges Canal [illegible] wells supply water for fields [illegible]

277. [illegible] nd consequently it requires longer water supply.

278. (67) **Cotton** *versus* **wheat**.—Wheat is preferred to cotton, because the former requires watering only thrice. There is abundance of water supply in the wheat season, and besides, it does not require so [illegible]

vators may be provided with new *gulabas* (sluices). The water rates cannot be said to be higher on cotton when compared with other crops, still I think it will be very helpful to allow special concession for exotic cotton. Chain pumps and other machines may also be set up on canals by the side of the *gulabas* (sluices), wherever desired by the cultivators.

II.—Central Provinces.

Sir FRANK SLY, K.C.S.I., I.C.S., Commissioner, Nagpur Division, Central Provinces.

Examined at Nagpur, November 4th, 1917.

Written statement.

[illegible] ly grown in this [illegible] tton department in [illegible] varieties. These were tried at cotton farms in charge of European gardeners, but were abandoned as a hopeless task. An occasional American cotton plant, known as Upland Georgian, still found in cotton fields, is the sole survival of these efforts. Attempts were also made to extend the cultivation of the indigenous varieties,

and special efforts were made to popularize the best local variety known as bani in the Wardha district end by different names in other parts. These efforts to spread the cultivation of bani also failed, for the cultivators found it more profitable to grow coarser varieties. By the irony of fate, the result of these mea- sures was to bring into general popularity still coarser varieties of heavy yielding capacity, which are believed to have first been brought from the Nerbudda valley and to be the origin of the varieties now classified as *roseum* and *roseum cutchica*. A full account of these measures will be found in an article in the Agri- cultural Journal of India for April 1907 (Volume II, part 2). The subsequent history of general cotton cultivation has been the steady ousting of *bani* by the mixture of coarser varieties generally known as *jari*, until the former is now grown only as a partially pure crop in the more distant and isolated tracts above the southern ghats of Berar and even there is rapidly disappearing with the spread of the more profitable *jari*. Later attempts have been made on the Nagpur farm and elsewhere to test American and Egyptian varie- ties and also better staple cottons from other parts of India, but all have ended in failure. At one time there seemed a small hope of success for Egyptian cotton under irrigation, but this hope had to be abandoned. Acclimatized American varieties, known as Upland Georgian from the Central Provinces, *buri* from the Sonthal Parganas and Cambodia from Madras, which seemed more hopeful than newly imported seed, have also been fully tested and have failed. During my service in Berar, a considerable effort was made to introduce *buri* into general cultivation, partly because it was likely to suit the lighter soils and partly because it was resistant to the cotton wilt disease, and cultivators were induced to grow it in a few thousand acres, but abandoned it after a fair trial. It was also found that the fibre of these exotic varieties gradually weakened and deteriorated. The recent work of the provincial department of Agriculture is rapidly resulting in the disappearance of the less coarse varieties in the mixture known as *jari*, and the substitution of pure *roseum*. The rapidity of this change is evidence of its popularity with the cultivators and the increased profits that it has put into their pockets.

282. *Causes of failure.*—I now proceed to give my views as to the causes of these repeated failures to improve the quality of the cotton, prefacing them with the remark that I have no scientific knowledge of agriculture. The ultimate fact is that it has hitherto been impossible to find any variety of long staple cotton that can approach the coarse variety as a profit producer. *Bani* is a light yielder with a ginning percen- tage of 26 per cent as compared with the heavy outturn of *roseum* with its ginning percentage of 39, the result being that the yield of lint from *bani* is only half that given by *roseum*, and the difference of price on account of the superior quality covers only a small fraction of the difference in yield. American varie- ties and long staple Indian varieties have uniformly failed to give any favourable result. The rainy season *is restricted to about* 3½ *months and the growing season to about five months*. In the stiff black soil of the cotton tract, the plants suffer from excessive moisture and water-logging during the rainy season, checking their growth, and a break in the rains with a spell of hot sun causes substantial damage. The growing season is too short to allow them to *come to full maturity* and, consequently, the yield is small and the fibre weak. So far as my experience goes, long lint means a long growing season, and this cannot be secured under the ordinary conditions prevailing in the Central Provinces and Berar. Experiments in the breeding of new varieties have hitherto not succeeded in producing a cotton of long staple with early maturity and a good yield. Until science is able to solve this problem of combining the qualities of long lint, early maturity and good yield, there is no prospect of *securing a long staple cotton* suitable for this tract. It is not for me to say that the problem is insoluble but until it is solved, I have no doubt that the policy of the Provin- cial Department of Agriculture *in providing pure supplies of the coarse heavy-yielding roseum* variety has been in the best interests of the cultivators and has added greatly to their material resources.

283. *Prospects of long staple cotton under irrigation.*—There is one new factor that has to be taken into account, which is the construction of *irrigation* works. These have generally been undertaken as protective works against famine in the rice tracts, where cotton is not usually grown. The stiff black soil of the cotton tracts is not well adapted to *irrigation, and* I do not believe that there is any future for irrigated cotton in these tracts. As stated above, experiments on a small scale on the Nagpur farm failed. Most of these irrigation works *depend on* storage in reservoirs, and there is not a supply of water available at the end of the hot weather for use in advancing the sowing season before the start of the monsoon, and irrigation after the close of the monsoon is not very suitable for cotton in black soil, which is tenacious and not well drained. Experience seems to show that finer lint is produced from the same cotton grown on light soils than on heavy soils. There remain the light porous lateritic soil of Chhattisgarh (known as *bhata*) and the light sandy soil of Chanda, which are suitable for irrigation. Owing to labour requirements it is difficult to combine cotton with rice, and I doubt if there is much hope for irrigated cotton in Chanda. In Chhattisgarh, the trial of irrigated cotton on the *bhata* ridges has, I believe, been successful in three years out of four, the fourth being a failure on account of insects. This seems promising enough to conti- nue the trial of long staple cottons, but I doubt whether there is much prospect of any substantial area of long staple cotton, even if trials confirm its possibility, owing to the sparsity and character of the cultivators.

SIR FRANK SLY, K.C.S.I., I.C.S., called and examined.

284. (*President.*) I have had a long experience of these provinces. *I am of opinion that the present* policy of the Agricultural Department in pushing *roseum* is sound. *Judging* by past experience of exotic and long staple cottons, I consider there is no ground for hope of their success unless the Agricultural Depart- *ment can* produce a long staple cotton that has the combined qualities of early maturity, good yield and high ginning percentage. Although experiments have been going on for the past fifty years, that problem has never been solved. The province has never had a botanist working on cotton as his principal subject. The Agricultural Department, however, tried experimentally a very large number of American cottons, as well as long staple *cottons* from other parts of India and have examined botanically the cottons grown in the province. Some years ago, when I was Director of Agriculture, hundreds of varieties of cotton were tried but they all failed. The experiments were conducted under the supervision of Mr. Mollison, who was then Inspector-General of Agriculture, and Professor Gammie, the Imperial Cotton Specialist, who visited the province on several occasions and gave us a lot of advice. The only line of work on the botanical side which the Provincial Department has not pushed to its logical conclusion is hybridization. A good deal of hy- bridization was done in the old days by the agriculturists before the province had a botanist, but it failed to produce any variety of cotton of any value. I should not like *to* go so far as to say that all scientific possi- bilities have been exhausted. I am not a scientist, and whether the problem is soluble or not, I cannot say, but in the Central Provinces hitherto it has not been solved. So far as I am aware the botanist in this pro-

not been in touch with cotton problems but some ten years ago we made enquiries into the point and found that a substantial part of the coarse cotton of the province went to the Continent of Europe and was there I understood used not for the manufacture of cotton goods but for admixture with wool for the manufacture of coarse fabrics consisting partly of wool and partly of cotton On that account it had a higher value of its own than it would have had purely for cotton goods There certainly was a steady demand for it It was mainly required for export and so far as I could trace went mostly to the Continent of Europe to Germany and to France In the interests of the Indian cultivators it is very undesirable to stop a profitable crop a crop that is more profitable than any long staple cotton yet tried If the statistics for this province are examined as I have stated in my written evidence it will be found that the outturn of *roseum* in lint is practically double that of our long staple *bani* The price that *bani* fetches is nothing like double but only

low With the opening of the railways the cultivators have had a very prosperous time and the difficulty has always been to get them to take up any new crop even if it had big money in it because they already had sufficient to meet their needs Some irrigation projects have now been constructed in Chhattisgarh If these canals are to be a success there must be a much larger population in the tract than there is at present If unirrigated rice is to be irrigated and broadcast rice is to be transplanted it must mean a very large increase in the labour supply of the country Rice is popular with the ryots and for many years their attention will be directed more towards the improvement of rice cultivation than to the introduction of a new crop like cotton The labour question in Chhattisgarh is a very big one I think that progress will be very slow because the labour is not there to grow irrigated crops and secondly because the cultivators are so well off under the present system that they will not take to intensive cultivation as in more highly populated tracts in north India As to the possibility of success with long staple cotton I think that so far as the true cotton tracts are concerned there is no reasonable possibility of success unless the scientist can produce a cotton with the qualities I have mentioned In Chhattisgarh even if a long staple cotton can be successfully grown on the *bhata* soil it will take a very long period of years before any very large quantity of it can be obtained

286 As to the value of an Imperial Cotton Specialist my own view of that question is that the appointment of the Imperial Cotton Specialist was probably justified when it was made because very little was known about cotton in India at that time and it was desirable to have an officer whose special

...nexion with cotton
...nclined to favour
...ovincial but that
...ose tracts each
working out his own particular problems rather than by a central staff I ... I do not think that the appointment of an Imperial Cotton Specialist or of an Advisory Committee would be advisable More value would be got out of the same money if it were put into the cotton tracts in the provinces

88 The Industrial Commission is I believe considering a scheme for centralising the staff of scientific

ing agency for their own special branch Whether it would be desirable that all botanists should be placed in one department with a Director of Botany at the head and Deputy Directors for particular branches is a very large question. It has very decided advantages I should say that one of the essential conditions on which the Agricultural Department would have to insist if it participated in that scheme would be that certain posts in each province should be filled and that the men appointed to those posts should be left in the province for a minimum period of, say, ten years unless for any particular reason the province desired to change I think it would be detrimental to the work of the Agricultural Department if all the present scientists on the staff were taken wholly out of the control of the Provincial Governments and were *liable to*

be sent here and there in different parts of India on short jobs, but if a condition were secured that each province should have a staff which should remain in that province for a substantial period of years, say, a minimum of ten years, without change unless the province desired it, I think that that would fairly well meet the needs of the Agricultural Department and at the same time it would get considerable advantages in the matter of direction.

289. (*Mr. Wadia.*) I was in Berar for five years and I used to see a good deal of the cotton ginning factories. I know that there are pools amongst the factories. My impression was that they were detrimental to the interests of the cultivator, that they were formed wholly in the interests of a ring of ginning proprietors, that they kept up the rates substantially higher than were necessary to cover the cost of ordinary ginning, and that they had the disadvantage of increasing the number of gins hopelessly out of proportion to the real requirements of the tract. In a small town in Berar, there were several ginning factories to do the work which really one ginning factory could have done adequately. Cases occurred in which a gin was put up solely with the object of sharing in the profits of the pool, and never worked from the day it was put up. It had to be let into the pool but never ginned a maund of cotton. A system of working licenses would have to be coupled with conditions regulating monopoly. There would have to be fixed rates if a monopoly was granted. I personally would like to see all these pools smashed if it were possible to do so. The only trader who ever took any action in that line in Berar was Ralli Brothers and they endeavoured to smash the pool by refusing to come into the pool and getting [illegible] at a lower rate. The result of their action was that they experienced great difficulties in the [illegible]; the rest of the trade combined against them, and put every difficulty in their way in the purchase of cotton. I think that, in the end, Ralli Brothers had to give way to the extent of [illegible] that they would only gin the cotton that they bought for themselves. The exorbitant profits which the pools make for division amongst themselves must of course come in the end out of the cultivator's pocket. Whether this monopoly should be stopped by legislation or something of that kind is a very big question, which I should not like to answer without consideration. The suggestion involves a serious interference with public trade, and would create a monopoly in favour of licensed ginning factories through abolishing pools. It might stop the present evil, but it would create a monopoly in favour of licensed ginning factories. It would [illegible] some of the evils of the present system, but whether it would have greater evils at all, I cannot say. It is a very serious interference with the freedom of trade.

290. I am afraid I cannot say whether the ginning and pressing factories send their weekly and fortnightly returns regularly in due course because I am not in touch with that question. If difficulty is experienced in getting the returns regularly from ginning factories for statistical purposes, I can see no objection whatever to requiring them by legislation to submit such returns.

291. When I was in Berar, I saw a tremendous lot of damping of cotton. You could go into a pressing factory and see a hose pipe playing over the heaps of cotton. I believe there even respectable firms deliberately watered cotton. It was the common practice in a large number of pressing factories. This was about 1906—1908. If it was clearly proved that watering was done at factories and a system of licensing were adopted, it might be made a condition that if fraudulent practices were proved, that the license should be withdrawn. We made a certain amount of enquiries when I was in Berar about the damping of cotton. The main difficulty was to fix the responsibility for it. The pressing factories in Berar bought a certain amount of cotton on their own account; they also pressed cotton belonging to other people brought to the factories. The question arose therefore as to whether it was the ginning factory or the owner of the cotton or some one else who was responsible for the damping. I have not seen ginning factories damping the cotton. When cotton arrives at Bombay and is found to contain an excess percentage of moisture, the question will arise as to who is responsible for having damped it. Another considerable difficulty that would arise would be in fixing a percentage of moisture by statute. So far as I recollect, when the question came up, experts said that it varied considerably. It would therefore be necessary to fix a fairly high percentage to cover exceptional cases and this would permit addition of moisture. Finally it was considered that the trade had the remedy in their own hands if they only liked to enforce it. If the trade were prepared to accept and co-operate in such a measure, it might be a good thing to establish a testing house on the lines followed at Havre. I see no *primâ facie* objection to such a course, but the question is one for the trade. The difficulty in regard to a penalty enforced by law is very much greater than in regard to a penalty connected with the failure or breach of contract. The Cotton Trade Association of Bombay manage for themselves without legislation. The proposal now suggested for consideration is that a law should be passed making it a criminal offence to possess cotton above a certain percentage of moisture. My opinion is against it. Even if instead of making it a criminal offence it were enacted that the license should be taken away, there would be very great difficulties in the way. Why should not the trade exercise the absolute remedy that they have in their own hands? If the Bombay Cotton Trade Association were to provide penalties in contracts for moisture above a certain percentage, that would be a more satisfactory solution of the problem.

292. As to the mixing of poor varieties of cotton with better ones in Berar, in my time, there was only the common variety known as *jari*, which itself is a mixture of varieties but it is not a mixture in the trade sense of the term. Above the *ghats*, a fair amount of *bani* was grown. It was mixed with *jari* in the field to a certain extent and there was also adulteration after the crop was picked. There was a distinct mixture of varieties in the ginning factories. Sand was not mixed with *bani*, only a proportion of coarse cotton. The fine *bani* that was produced in the field where it might be fairly pure was adulterated by mixture with a certain amount of coarser cotton. The result was the mixture of seed and the crop deteriorated in a few years.

293. I am really not a very great expert in the cotton business but there was one striking feature which I noticed in Berar and that was that the marks of different stations had different values in the Bombay market. For instance Khamgaon cotton with Khamgaon railway station mark had a higher value than cotton from markets higher up the line and so, at Khamgaon, I have seen carts that had come in all the way from Hyderabad State, travelling by road over a distance of a hundred miles, in order that the cotton might be disposed of at the Khamgaon market instead of being taken to the railway station in Hyderabad that was not more than fifteen miles from the place where the cotton was grown. I was told that this was due partly to the higher value of the cotton in the Khamgaon market and partly to inefficient arrangements in the local cotton markets.

294. The question whether you could prohibit by law the transport of cotton by rail except in fully [pres]sed bales is one I have never considered, and I would not like to give a rash opinion about it. As to [prev]enting the mixing of cotton, the question seems to be whether the trade has not got the remedy in its

own hands I would not advocate anything on the lines of the old Bombay Act. From what I have read on the subject, it was a complete failure The abuses of such a system would be greater than the advantages that would accrue.

295 I have never examined the question of an export duty on cotton. So far as I have given any thought at all to subject I can see no *primâ facie* objection to a small export duty on cotton I understand that there are considerable practical difficulties connected with the levy of such a duty So far as the Central Provinces are concerned, I do not consider that a small export duty on cotton would be open to any great objection.

296 (*Mr Hodgkinson*) As to the question of bridging over the gulf between the time when long staple cotton is grown in small quantities until such time as it could be grown in commercial quantities I am sorry that I cannot express any definite opinion. That problem has been considered by the Agricultural Department for a considerable number of years Two or three different plans have been considered in considerable detail but I am not in touch with the actual results of the trials of these There is the system of auction managed by Government, there is the system of giving a small premium to the cultivator

grievance against the railway as higher rates of freight were charged for considerably shorter leads It was cheaper to rail cotton from Wardha to Bombay *via* Nagpur than to send it direct from Wardha It was the rates of one railway only that were concerned

great drawbacks to the development of the country, but it is not possible to remedy these defects by colonization. There have been several attempts at colonization in this province, but none of them has ever been a substantial success and as the result of past experience the policy of Government is not to undertake any colonization scheme on a big scale but to trust to immigration without Government assistance and the natural increase of population in the tract There are substantial tracts in Chanda at present under forest which are

sugarcane companies For reasons which it is unnecessary to enter into the efforts made in this direction have hitherto not proved successful

ent in
ed out
muous

cultivation. The point to be remembered with regard to Chhattisgarh is that there is not merely an agricultural but also a very big economic problem As to whether *bani* means almost anything with a long staple my experience of Berar was that though *bani* was substantially mixed in the field it was a particular variety The figures in my written evidence were based mainly on experiments carried on by the Agricul

carried out only on the
As regards to the list of
ni and according to which
that he has bought *bani* with
only say that the ordinary
selection of *bani* was 25 per
naining part where fairly fine

n the seventies
has consisted
s territory they
r ten years ago
Some of that

bani must have been among the best Indian cottons that existed. I understood that *bani* stood almost the first amongst the indigenous cottons. When work on cotton was started, samples of all the cottons grown in the province were collected and grown and tested on the Government farms; they were botanically examined and the different varieties were selected pure and tested pure, and I do not think there is any possibility in the Central Provinces of a pure *bani* type having been overlooked.

301. (*Mr. Roberts.*) In my written evidence, I have stated in regard to *bari* that it was found to become weaker in fibre; this deterioration was not due to any mixture. The *bari* was grown absolutely pure under the supervision of the Agricultural Department. I do not think that the deterioration could have been due to presence of other American types, but Mr. Clouston would be able to tell you better about that. My experience in Berar was that pure *bari* was supplied by the Agricultural Department, and was grown under a certain amount of supervision by the Agricultural Department; the cotton was collected and special arrangements made on behalf of the cultivator for the ginning of the cotton separately and for sale. I do not, therefore, think that there was any possibility of the seed becoming deteriorated due to admixture. *Bari* has been growing in the Central Provinces for many years. It came originally from [illegible] Chota Nagpur. The Cotton Committee [illegible] the type of cotton known by the name of Upland Georgian which is still to be seen as a [illegible] plant in the Central Provinces. *Bari* cotton is an American type of cotton of [illegible] but Mr. Clouston will be better able to tell you. I do not think there has been any [illegible] selection of *bari* for length of staple.

302. As to the suggestion that [illegible] cotton proves a profitable crop on the *black* soil of Chanda and Chhattisgarh, it is possible that [illegible] will disappear gradually and that it is merely a question of [illegible] only true within limitations. You have to reckon with the [illegible] of the cultivators. My impression is that the inclination of the cultivators will be directed towards [illegible] cultivation rather than to the growing of cotton.

303. As to the spread of *roseum* cotton [illegible] for example, in the Nizam's territory and [illegible] would be that the cultivator would [illegible] crop of cotton for the sake of imported *roseum* from any other part of [illegible] more profitable crop. Mr. Clouston's [illegible] before the Agricultural Department took up *roseum*, [illegible] the percentage of *roseum* in the mixture [illegible]. The Agricultural Department [illegible] the process. The idea of putting [illegible] in the Central Provinces [illegible] elsewhere seems to me impracticable. The factors which [illegible] of long staple cotton in this province are high ginning percentage, greater yield and [illegible]. The [illegible] the ginning percentage is low. If the Agricultural Department could produce [illegible] in the nature of a medium cotton with a better yield and a better ginning percentage, there would be no difficulty in getting the cultivators to take it up, but until you can put on the market a variety of cotton which is going to give a bigger profit than *roseum*, you cannot possibly expect the cultivator to grow it. I have always understood that this particular type of cotton has, as I stated before, an additional value as [illegible] for mixing with wool and so it cannot be judged purely on its cotton value. This applies to all coarse cottons. If the factor of freight becomes of sufficient importance to [illegible] the price of short staple cotton compared with that of long staple, the position may have to be reconsidered, but it has not affected the position so far.

304. The actual study of the breeding of cotton has not been taken up in the Central Provinces in the same way as it has been taken up by Mr. Leake in the United Provinces. A certain amount of breeding work was done for some years, but I cannot say that it was carried out very systematically, or perhaps according to a very high standard. The results were negative, but it was not in charge of a botanist with special knowledge of hybridization. I think there has been no work done in the Central Provinces comparable to Mr. Leake's work in the United Provinces on cotton.

305. As to stand pipes in pressing factories, the excuse was often given that they were there for fire insurance purposes, but I have myself seen the hose playing over the heaps of cotton.

Mr. C. G. LEFTWICH, I.C.S., formerly Director of Agriculture, Central Provinces.

Examined at Nagpur, November 11th, 1917.

Written statement.

I.—Agricultural Experience.

306. (1) **Experience.**—I was Deputy Commissioner of Nimar District (Khandwa) from 1906—1911 and of Chanda, 1912-13, both of them important cotton-growing districts. I was Director of Agriculture in the Central Provinces from November 1914 till March 1917. I have been a good deal in actual touch with cotton cultivators.

307. (2, 11 and 21) **Varieties.**—*Deshi dharwari* and *jari* were all grown in Nimar, and *jari* in Warora Tahsil of Chanda. *Bani* and *buri* were tried by enterprising cultivators in Nimar, but were not very successful. "Upland Georgian" was also tried in Nimar during my incumbency there, but it was not a reliable crop.

308. *Comments on Mr. Clouston's Notes.*—I regret I have not had time to collect detailed information for other questions in this part. I offer the following comments on Mr. Clouston's Notes[*]:—

I.—Mr. Clouston's Note on improvement of Cotton Cultivation in the Central Provinces.

Paragraph 8.—I am rather doubtful whether the investigations mentioned have been persistent and continued long enough for us to say finally that it is not possible to select a wilt-resisting *neglectum* cotton.

Paragraph 10.—I am strongly of the opinion that we should do much more to experiment with cotton crosses in order to improve the staple, while maintaining a high production of *kapas* per acre and a high

* *Vide* p. 79 *et. seq.*

ginning percentage of lint I speak as a layman of course, and the problem may be impossible of solution, but I do think that a plant breeder should make a special study and work out the Mendelian factors of

ordinated efforts to improve the staple of *roseum* by plant selection, presuming the botanists hold out the hope *of any success From these paragraphs of Mr Clouston's Note, it would appear that all efforts made hitherto* in the past seven years have been with a view to improve the ginning percentage

II.—Mr Clouston's Note on attempts to introduce long stapled cotton.

In Nimar, the old *deshi* variety survived the attempt to introduce "Hinganghati" in 1868, but about 1892 some Khandwa *banias* brought *dharwari* seed from Berar The name suggests that this cotton may have had some connection with Dr Forbes's efforts to improve the cotton of Dharwar, but, if so it was not a success from the point of view of staple It instantly became immensely popular in Nimar, and almost entirely ousted the old *deshi* cotton in a few years It was probably closely related to Berar *jari* and, as described by Mr Clouston, largely consisted of different varieties of *negl ctum*

III—Mr Clouston's Note on the organization of district agricultural work

IV.—Mr Clouston's Note on "*Deshi* short stapled cotton"

Paragraph 7—These provinces produce a large surplus of rice It would therefore be perfectly safe economically to institute a series of experiments on a field scale through selected cultivators (probably members

V—Cotton Forecasts

I do not agree that our forecasts are very accurate and very much doubt if we should waste time compiling them when our staff is still so inadequate Large buying firms like Ralli Brothers and Volkart Brothers make their own forecasts and their purchases are little influenced by our forecasts.

Mr C G Leftwich, I C S called and examined

... cottons by hybridization in ... *roseum* meets ... to the other ... high ginning ... the demand ... a botanist

begun work on cotton There is enough work on cotton ... the present policy of putting all our eggs in the *roseum* basket is sound I think I have hinted as much in my annual reports

310 (*Mr Wadia*) I have not recently watched whether the difference in price between long and short staple is rapidly increasing ... I had some

offered proprietary rights they would have come. I also tried to get colonists from Chhattisgarh just over the border. Some actually came and looked at the land, but they decided on the whole that it was too far from their homes. I think that it might be possible to get colonists from Bihar and Orissa for the Chhattisgarh plains. The proprietary right here is vested in the *malguzars*. I do not know whether they would be willing to sell their proprietary rights. I have heard that they are becoming convinced of the value of their waste lands and would be glad to get cultivators to break them up. From what I have seen of Cambodia on irrigated *bhata* land, I am most optimistic about it, but the experiment has been of short duration. It was not recommended strongly in Chanda on the ground that it required labour at the time that labour was also required for transplanting rice, but I think we ought now to examine very carefully the comparative economic advantages of transplanting rice as against growing long staple cotton on those areas when the conditions are favourable for the cultivation of both. If Cambodia proved successful on these lands, the area that we could work up to might be anything from one hundred thousand and upwards to a million acres. I am including in that the light soils in Bhandara and Balaghat which are irrigated by village tanks. As to labour, it is a question of comparative value : if we were prepared to give up rice land to cotton, the labour supply would be adequate. If you leave the present rice land out of calculation, then the additional lands available for cotton would only be in the Chanda and Chhattisgarh districts. But the class of cotton would be very superior which is really what matters. I am very optimistic about the possibilities of the *bhata* land of Chhattisgarh. Of course I say this as a layman.

312. As to non-irrigated tracts, I am afraid that the present *bani* is practically hopeless. I am not sure whether there has been sufficient plant selection work on *bani*. I do not think that very much has been done in the way of keeping the types separate, selecting productive plants, and so forth. As regards Sir Bezonji Mehta's statement that the *bani* which he had purchased had been ginning at 35 per cent. while the *jari* purchased by him ginned 31 per cent. and the idea that this indicates that we ought to go on selecting, I am not, however, very hopeful.

313. When I was in Nimar, we tried both Upland Georgian and *buri*. We tried to get them introduced because we believed in them and we induced some of our more advanced cultivators to cultivate large areas. They cultivated well ; sometimes they got good results and sometimes bad. *Buri* was a most uncertain crop and it was liable to be damaged either by excess of rain or by want of it. We distributed the seed to the *malguzars* and they distributed it to the cultivators. The *malguzar* grew it on his own home farm and the *patels* (village officers) looked after its cultivation in the *ryotwari* villages in which the seed was distributed. It really got a fair trial. We induced the Burhanpur Tapti Mills to give a small premium on small quantities. The mills were hopeful the first year, in the second year they were less hopeful and in the third year they said that the yield was too uncertain. This was in the Nimar district which is practically Khandesh.

314. (*Mr. Roberts.*) We sold the cotton by arrangement with the Burhanpur Tapti Mills which was in one of the selected tracts. I do not remember whether we got the real Bombay price, but my recollection is that we discovered that it was not very liberal. The difficulty in getting a premium during the three years in which it was grown was that the quantity produced was very small ; and that the mills objected to having such small quantities separately ginned and kept entirely separate. Some *buri* cotton is still to be found in the fields. The proportion varies very much. Sometimes there is forty to fifty per cent. of it in ordinary *jari*. I am sorry I cannot say whether it is very common in Nagpur. The produce of the field would be sold as *jari*.

315. (*President.*) I am not in favour of the proposal to publish Bombay and Liverpool prices in upcountry markets. I do not recommend it because it is rather a big thing to arrange for. So far, there is keen competition in buying in our cotton markets, and the result is that the cultivators are not deceived by the purchasers in regard to prices. I do not think that it would be any advantage to the cultivator to publish the prices.

316. As to the forecasts, we are really too shorthanded to undertake the collection of the figures and we have a lot of work for our men to do. We have been recently ordered to take over the whole of the crop cutting experiments and that means that it will take up much of the time of the whole of our staff and keep it very busy. I doubt the advantage of the Agricultural Department taking over the work of collection of the figures. The forecasts are actually compiled by the revenue staff, *i.e.*, by revenue inspectors under the Deputy Commissioner. The Deputy Commissioners send their returns to the Director of Agriculture. The Director of Land Records is also the Commissioner of Settlements. The statistics are compiled by him. We criticize the Deputy Commissioner's forecast, but the Director of Land Records actually compiles the forecast. The forecast is issued over his signature.

317. Cotton suffers much from insect pests, but I cannot say to what extent. It suffers from boll-worm and to a less extent from wilt. I think these provinces ought to have a whole-time entomologist not only for cotton but for other reasons. We have had several times to call in entomological assistance from Pusa and our entomological report is always a very meagre one.

The Hon'ble Mr. J. F. DYER, I.C.S., Third Secretary to the Chief Commissioner of the Central Provinces.

EXAMINED AT NAGPUR, NOVEMBER 14TH, 1917.

(*No written statement was submitted by the witness.*)

318. (*President.*) I am giving evidence as Secretary to the Local Administration in regard to the matters referred to in the three papers I have submitted, that is to say, the increase in the number of demonstration farms, the expansion of the Agricultural Service and the improvement of crop forecasts. The intention is that there should be in time a farm in each district for the testing and propagation of seed and for demonstration, central farms, such as those of Nagpur and Akola, being kept on for general purposes, including experiment and research. Some of the new farms are to be financed from the wheat profits and considerable progress is already being made in the programme. Proposals have been submitted for increasing the number of Deputy Directors from three to seven, with a suitable number of assistants and for the appointment of a second botanist, a mycologist and an entomologist. I do not think that the Chief Com-

missioner would have any objection to a botanist devoting a considerable portion of his time to the cotton breeding question.

319 *The differences between the actual outturn of cotton and the estimates in the forecasts during the*

work through selected culti ltivator is very backward and is ready to buy any seed fro the season, or anything or anybody except himself if the crop g in the district who realised the importance of pure seed. There has not been nearly as much progress made in the Nagpur and Wardha districts as in Akola.

323 The letter I have put in about the expansion of the Agricultural Service only deals with the

the local man from a cultivating family and recently we have had more success in this direction than when the College first opened.

324 (*Mr Hodgkinson.*) The bridge between the cultivator and the buyer could be crossed by only giving out seed to trustworthy cultivators, who would grow it on their own seed farms and pass it on to other culti wheat. e mills til the super ir own about I do at the ion, as

ANNEXURE I

Chief Commissioner, Central Provinces, Department, No. 169 A XIII, dated

may expect, if the conditions of season and rainfall are "neither very favourable nor the reverse now well estab-

who, in talking he principles ex Sir Benjamin Robertson does not think that it is necessary to adopt any special measures to impress the definition of a Improvement h posts, and this cts of promotion stimates of the before they are submitted to the Deputy Commissioner, rds and his Assistants satisfying that the Revenue Inspectors have Records should always be in a modifying the figures he receives. ntendents of Land Records and

Assistant Superintendents of Land Records, and it is hoped that in time they will bring more intelligence to bear on this important branch of their work than has always been the case in the past.

4. The difficulties of obtaining accurate estimates of the area and quality of crops is, however, small, compared with the difficulty of forecasting the outturn. There is, for each crop in each district, a standard outturn which is examined and revised, if necessary, every five years by the Director of Land Records, but Sir Benjamin Robertson has grave doubts if these standard outturns can ever be of much practical use in ensuring accuracy in forecasts. In the past, the crop experiments, on which the standard outturns are based, have been arrived at by the District Staff, and experience shows that they have not, as a rule, the necessary knowledge to conduct experiments in such a way as to give results of value, and many of the experiments have to be rejected as more or less worthless. When a district is under settlement, crop cuttings of more value are carried out by the Settlement Officer and his Assistants, but a settlement occurs only once in twenty years, and these experiments are directed more towards ascertaining the relative value of soils than towards arriving at average outturns for the district. Arrangements have recently been made for the gradual transfer of the work of experimental cuttings from the District Staff to the Agricultural Department, but it will be some time before that Department is strong enough to take over all the work, and longer still before it has collected sufficient data to draw inferences from the experiments which it conducts; and though these experiments may, in the end, prove useful for agricultural and settlement purposes, it is perhaps open to doubt whether they will prove of real value from the point of view of crop forecasts. I am to illustrate the difficulties in the way of accepting them from the three chief crops of the Provinces, for which forecasts are prepared, *viz.*, cotton, wheat and rice.

5. Cotton is grown by cultivators of all degrees of merit, from the man who sows carefully selected seed on properly prepared and manured land and who keeps his crop clean by frequent interculture, to the man who sows damaged and impure seed from steam gins on unmanured land that has been harrowed once and who weeds his crop in a perfunctory fashion, and, more important still, it is grown on a very wide range of soils from the poorest to the richest. The crop is gathered in a succession of pickings over a period of two to three months, and while the good cultivator picks his plants bare, the bad often leaves much of the last picking to rot. With infinite trouble it might be possible to arrive at a standard that allowed for all the varying conditions of soil and cultivation, were it not that the vagaries of the season may upset the calculation. Thus a heavy fall of rain in September will make the poor soils yield a much increased crop while the prospects of the cotton in the richest soils will decline, as water-logging will stunt its growth and cause the bolls to rot. If, on the other hand, September be rainless, the poorest soils will give a very poor yield, whereas the richest may be able to carry on with the moisture they already contain and give a fair crop. No standard outturn and no amount of care in estimating the quality of the crop in any year can allow adequately for all the varying factors in the calculation.

6. Wheat is not grown over such a wide variety of soils, but the range is still considerable A good early monsoon has the effect of expanding the *kharif* area and hence less room is left for *rabi*. If the late rains be poor, the lighter soils, which in a year of heavy rain are put under wheat, are devoted to gram or some other less important *rabi* crops. And rain in the cold weather, or the lack of it, has the effect of drawing together or putting further apart the outturns of the worse and better soils.

7. For rice there is the further complication of irrigation. In a year of plentiful rainfall, the difference between the outturn in irrigated and unirrigated land and in light and heavy soils contracts. The water in the tanks is not used for irrigation, because without irrigation, the land can yield as much as if it were irrigated, while the outturn of the uncommanded land in many cases rises to the same level. Besides, the degree of skill and care taken in the cultivation of the crop, even within the limits of one district, varies as much as is the case with cotton.

8. At present the variations in the outturn due to the causes mentioned above are supposed to be allowed for in the fraction representing the relation of the crop reported on to the normal per acre, for the estimate of outturn is the multiple of the area under the crop, the standard outturn and this fraction. But no agency can take all the factors pointed out above into consideration, and the result is that the forecasts must always be unreliable. This difficulty has been overcome, to some extent, in the case of cotton, by prescribing that the estimate of outturn should be given as a percentage increase or decrease on the outturn of the preceding year. Much better results can be obtained by cross-examining cultivators as to the relative merits of this year's crop and last than by estimating this year's crop in the anna or American notation, even though the superior staff devote much care to the matter. And Sir Benjamin Robertson would accordingly suggest that the instructions in Government of India, Revenue and Agriculture Resolution No. 12-Agriculture, dated 18th April 1905, which now apply to cotton, should be applied to all crops for which forecasts are required.

Annexure II.

Letter from the Hon'ble Mr. J. F. Dyer, I.C.S., Third Secretary to the Chief Commissioner, Central Provinces, to the Secretary to the Government of India, Revenue and Agriculture Department, No. 1-c-XIII-c-155, dated the 1st June 1917.

I am directed to reply to your letter No. 1121-262-8, dated the 18th December 1916, on the subject of the expansion of the Provincial Agricultural Departments after the war. The Government of India express the hope that it will shortly be possible to exceed the scale already sanctioned, a course justified by past success, and suggest that, after the cessation of hostilities, new economic conditions may involve a still further increase. The Chief Commissioner proposes therefore to review briefly the situation in the Central Provinces and to explain what he considers to be the line of development which the Department should follow, indicating at the same time the immediate steps which he thinks should be taken, as soon as suitable recruits are forthcoming, to attain the object in view.

2. I am to deal first with the staff of Deputy and Assistant Directors. Three officers of each class are sanctioned, but at present there are only three Deputy Directors, one of whom is absent on Military duty and another is officiating in a privilege leave vacancy as Director of Agriculture. The single Assistant Director whom it was found possible to engage has proved unable to stand the climate and has recently left the service. But even if all six officers were on duty, Sir Benjamin Robertson contends they would not be able to cope for long with the growing activities of the Department. In Mr. Hullah's letter No. 106-XII-c-9, dated the 4th March 1915, in which sanction for the present staff was asked for, the Chief Commissioner, as a temporary

excluding the Sausar tahsil,

(5) the Narbada valley, comprising the Hoshangabad and Narsinghpur districts In this it is also proposed to include the remainder of the Nimar district, for although the latter contains a great deal of cotton, it is also important as a wheat growing tract, especially in the northern

In other words, the rice and wheat countries which have so far been treated as single units are really two and three distinct areas respectively, the rice country comprising (2) and (3) above, and the wheat country (4), (5) and (6).

4. Sir Benjamin Robertson does not propose to dwell on the manifold and rapidly growing activities of the Department, of which the Government of India are already well aware It will suffice, he considers, if he shows that the six tracts into which the Provinces have above been divided will soon require the attention of seven Deputy Directors

The cotton country, which is the present Western Circle, covers a large area and is the most advanced

to itself,

the more present rn rice ne and

The amount of work in these tracts which form the present Southern Circle,

(6) detailed above, er in charge, whose tion to the Satpura are very great and ity Directors of their untry one farm has

ment, and I am to set forth below the proposals which he wishes to recommend

6 As the object to be aimed at in the near future, Sir Benjamin Robertson advocates the establishment of five circles as follows —

I The cotton country.
II The eastern rice country.
III The western rice country.
IV. The Satpuras
V. The Narbada and north-western wheat country

would need account to re therefore for them to nt Director-

ships, and to allow for the expansion of the circles to six and afterwards to seven, and also for possible causalties, it would be advisable to recruit in each of the two succeeding years two men and in the fourth year at least one. This seems as far as it is necessary to estimate as matters stand at present; but, as already remarked, the Department's activities are constantly expanding and in a few years the whole situation may require consideration afresh.

7. In dealing with the research and instruction side of the service, the Chief Commissioner finds himself in some doubt as to the intentions of the Government of India. He still holds the view expressed in paragraph 6 of this Department's letter No. 536-XII-1-6, dated the 3rd February 1917, that if a Central Agricultural College is established for Upper India, direct appointments to the Provincial Service should be reserved for those who have graduated at it, and that, assuming for the moment that that college will be located elsewhere than at Nagpur, the local college should train only for the Upper and Lower Subordinate Service. This coincides with what the Agricultural Adviser to the Government of India has stated at pages 90 and 91 of his report for the year 1915-16. But in paragraph 3 of the letter under reply, the Government of India say that they consider it most desirable to bring the Provincial colleges as soon as possible up to the standard of instruction necessary to enable students to qualify for direct admission to the Provincial Service. For research work, a mycologist and entomologist are necessary in any case, and the Chief Commissioner would ask for their appointment as soon as conditions permit. But if, in the development of agricultural education, the Nagpur College is to aim only at giving the requisite education for the Subordinate Service and the preliminary course for a Central College, the present staff of a Principal, a Chemist and a Botanist, the two latter of whom are largely engaged in research work, is sufficient. If, however, it is decided that the college course should qualify for a direct admission to the Provincial Service, a separate chemist and a separate botanist for research will be necessary.

8. For the present the Chief Commissioner refrains from discussing the question of a regular leave and training reserve. He has given his reasons for advocating a gradual scheme of recruitment so as to do something towards avoiding a block in promotion.

Though he considers that it will be necessary in the long run to make provision for leave and training, to contemplate this now would only lead to more concentrated recruitment and accentuate congestion in the cadre. For this reason he is of opinion that the question should lie over for the present.

Annexure III.

Proceedings of a Conference called by the Chief Commissioner to consider the policy to be adopted regarding District Agricultural Farms.

The Conference met on the 30th May 1917 and there were present:—

The Chief Commissioner (Sir Benjamin Robertson).
The Financial Commissioner (Mr. Crump).
The Officiating Director of Agriculture (Mr. Clouston).
The Deputy Director of Agriculture (Mr. Evans).
The Third Secretary (Mr. Dyer).

2. It was agreed that, as funds became available and the expansion of the agricultural staff rendered it possible, the policy should be to establish a farm in each district for the purposes of seed-testing and seed production, demonstration and instruction. The farm should be situated as near as possible to the district head-quarters so that it may be easily controlled, be readily accessible to all visitors, and as much as possible in the public eye. In acquiring land, future requirements should be kept in view, and sufficient land taken up at once to meet them. Thus the possibility of having in time on each farm a hostel and school of the type contemplated at Powarkhera should be borne in mind. Where possible, cattle-breeding should be combined with arable farming.

3. In the wheat districts, an area of 150 acres was accepted as the standard for a district farm. Owing to the high seed-rate and relatively low outturn of wheat, most of this area is required for the propagation of pure seed, improved strains being introduced as they are thoroughly tested and proved to be suitable to local conditions. Without this source of pure seed every year, seed distributed by the Department would, under the prevailing conditions of cultivation and harvesting, soon tend to become impure.

4. In the rice tracts the area of district farms need not be so large, as the seed-rate of rice is lower and the outturn higher. The Chandkuri Farm of sixty acres is a suitable model.

5. In the cotton country, Mr. Clouston considered 100 acres a proper limit of size.

6. The main objects of cattle breeding should be the production of good stud bulls for sale to *malguzars* and the stimulation of their interest in improved methods of breeding and feeding. Technical matters, such as the evolution of a dual purpose animal for milk and draught, should be worked out and settled by the experts of the Department.

7. In pursuance of the above general lines of policy, it was decided that the following immediate steps should be taken:—

Northern Circle.

Saugor.—Acquisition of the site already selected by the Deputy Commissioner and Deputy Director of Agriculture on the Rahatgarh Road should be proceeded with. The Deputy Director should consult the Superintending Engineer, Circle II, as to whether he can undertake the buildings, the estimate for which excludes fencing. The Director of Agriculture should consult the Director of Agriculture, Bombay, on the subject of borrowing an expert for sinking the well.

Seoni.—The land already chosen for the farm is in the possession of *raiyats sarkar*, who are mostly men who sublet. Steps should now be taken to obtain possession from them, but the sub-tenants who are in cultivating possession may be allowed to continue until the farm is started. Work should be commenced in 1918-19 and the buildings provided for in the Public Works Department budget of that year.

Damoh.—The present farm of 48 acres is too small, and additional land up to a total of approximately 150 acres should be acquired as early as possible. As in Seoni, extra buildings required should be provided for in the 1918-19 budget.

Betul.—The recently established farm already covers about 150 acres. The Deputy Commissioner is eager to have it expanded, but the question should stand over until other districts have been provided for.

Chhindwara —A suitable site has been provis onally selected It should now be acquired but the farm should be the last to be actually started in the Northern Circle of those in the present programme so as not to over burden the Deputy Director

Jubbulpore—Approximately an extra 100 acres should be acquired for the expans on of the Kheri area so as to bring it up to the standard size Only departmentally constructed bu ld ngs are required For these the Deputy Director should arrange

The Deputy Director s proposals for a cattle farm are accepted but buildings should be constructed departmentally and as cheaply as poss ble

The proposal to have a farm at Sehora should stand over for the presen

SOUTHERN CIRCLE

Drug —A site has already

is not Government property h

and the money provided in the

priated for the buildings here

Bilaspur —The proposal for a combined arable and cattle breeding farm is agreed to The site should be selected and acquired but further work should be postponed unt l 1918 19

Works D partment

that a small ex

the cost of build

them constructed

WESTERN CIRCLE

Nimar —No definite proposal for a district farm has been put forward The D rector of Agriculture should formulate and submit a scheme

Berar —A farm in the west of Berar where *rabi* is important is cons dered necessary The D rector of Agriculture should consult the Commiss oner Berar and submit proposals

ANNEXURE IV

Area under cotton in the Nagpur D str ct

Year	Acres	Year	Acres
1894 95	1?6 9?3	1906 07	340 430
1895 96	108 895	1907 08	303 029
1896 97	150 ?44	1908 09	256 14?
1897 98	1?5 193	1909 10	23? 658
1898 99	137 640	1910 11	270 699
1899 1900	158 581	1911 12	?94 ?46
1900 01	238 139	1912 13	316 468
1901 0?	2?3 050	1913 14	345 084
190? 03	303 137	1914 15	348 983
1903-04	365 008	1915 16	?34 764
1904 05	404 411	1916 17	?09 18?
1905 06	476 171		

Mr H FREDERICKSON, Manager Bengal Nagpur Cotton Mills Rajnandgaon Central Provinces

EXAMINED AT NAGPUR NOVEMBER 14TH 1917

Written stat ment

I —AGRICU TURAL EXPERIFNCE

(a) *Deshi* ' *short taple cotton*

325 (1) Experience —I came out to this country in Ma ch 1897 and was sent straight up to Rajnand Shaw Wallace & Co had j st

e had extended the m lls to

quir es as to the poss bil ty of

increasing the area under cotton round about and also improving the qual ty

(2) I found that cotton was almost universally grown mixed with the other crops such as *kodo* (*Paspalum scrobiculatum*) *tili* (*Sesamum indicum*) and *tur* (*Cajanus indicus*) The variety was, I believe, *gossypium neglectum* and the method of cultivation certainly did not belie its name, for to all intents and purposes, no care whatsoever was taken. Seed was thrown into the fields and whatever *kapas* came to maturity was picked and sold locally, generally to wandering petty merchants, who either bought the *kapas* outright or bartered salt for it.

(3) The rainfall in the Nandgaon State, I very soon found, was too heavy for cotton, whilst in the further north the crop was grown better. It seemed to thrive owing chiefly to the smaller rainfall, though also, to some extent, on account of the more undulating country giving better drainage.

(4) As a matter of fact in the days before the mill was started by the late Raja Bahadur and before railways came to the Central Provinces, I believe the area under cotton in the north-west of Chhattisgarh was quite considerable, and I therefore came to the conclusion that there was no reason why it should not once more be grown extensively.

(5) The first step I took was to consult the Agricultural Department, and in 1900, Mr. Joshi, Superintendent, Government Farm, Nagpur, accompanied me on a short tour through Khairagarh and Nandgaon. We selected plots and got the Raja of Khairagarh and the Superintendent of Nandgaon to distribute some seed as well as to run small experimental plots. I myself had an experimental field in Dhaba village where I grew half a dozen different kinds of cotton. All the seed was distributed by the mill company free of cost for about three years, when considering that we had done sufficient to show that cotton could be well grown in lines, and as a crop by itself, we started charging a small amount for the seed. As the area under cotton extended, I found that it was not always a good thing to charge a low price for seed, and in fact I came to the conclusion that what cost the people little was valued by them at no more than its cost price and much of the seed went to feed cattle.

(6) In about 1909 Mr. Clouston, Deputy Director of Agriculture, and I toured through the States of Nandgaon, Khairagarh, Chhuikhadan and Kawardha, as also the four or five Zamindaries which lie between Chhuikhadan and Khairagarh States. Meetings were held in each place where we stopped, and arrangements were made to continue the distribution of seed, as also to get the area extended, and I believe the number of acres under cotton did extend until the year 1907-8, which was exceptionally wet, so that the cotton crop was almost entirely ruined and people who grew cotton lost heavily thereby. As a matter of fact, I have noticed all along that a succession of dry years tended to extend the area under cotton, whilst a single exceptionally wet year reduced the area by about half. In order to benefit the actual cultivators by providing a nearer market for their produce and to prevent them from mortgaging their crops in advance to local middle-men, I started a ginning factory at Kawardha in the year 1906 and advised all cultivators through the Dewans of the States that we would pay very full prices to cultivators bringing in the produce of their own fields. After a time, however, owing to the wet season and very small holdings, I came to the conclusion that this company could not continue to run the factory at Kawardha any longer, and it was accordingly closed down.

(7) In 1912, I accompanied Messrs. Low and Clouston to Kawardha, and we then arranged with the Raja to allot a piece of land as an experimental farm which would be run by the Agricultural Department. This farm has been running ever since, and when Mr. Clouston and I visited it last in 1917, the Raja agreed to take the plot of about sixty acres over as it was and to run it as a State farm.

327. *General results of these efforts.*—As regards general results from all the help and instructions which have during the past seventeen years been given to cultivators in the States round about here, I think I can say that the quality of *kapas* produced has been improved, and I have, during the last five or six years, always been able to pay a higher price for *kapas* coming from Kawardha and thereabouts where seed had been distributed than for that which came from Phuljhar, Sarangarh and Kalahandi, east and south-east of Chhattisgarh.

(2) I believe that the reason why the cultivation of cotton originally became less popular was entirely due to the smaller demand for the lint owing to the importation of mill-made yarns, which gradually supplanted the hand spun article. A few extra wet seasons also spoilt cultivators' faith in this crop, so it may be also said that the not perfectly suitable climate also prevented the people going in largely for its cultivation.

(3) The conclusion I have come to, therefore, with regard to this part of Chhattisgarh at least, are that the quality of the crop can be improved by means of providing the cultivators with better seed and also that they should not be advised to sow cotton except in exceptionally well drained land, say north of the Khairagarh State.

328. (5) **Rotations and manures.**—Manure of course would do much good and the value of this as well as of a proper rotation of crops is being demonstrated on the Government Demonstration Farm at Kawardha. Personally I do not believe that the cultivators will manure their cotton fields for many years to come. The villages do not produce a sufficient supply of manure for all the fields under cultivation and the cultivators invariably prefer to manure crops producing food in preference to such as produce a non-edible product like cotton.

329. (7) **Conditions affecting increase in area.**—There is no long stapled cotton grown in Chhattisgarh except under experimental conditions, and so far my experience has gone to show that the longer stapled varieties require more attention and do not, under present differences as regards prices, pay the cultivators. There is no doubt about it and it has been proved over and over again on the demonstration farms about here that cotton even in a poor year pays better than many of the crops grown regularly by the Chhattisgarh villages. I refer particularly to *kodo*, which, as far as the profit per acre is concerned, would not seem to be worth growing at all except that it is a food crop and can be grown on poor land.

330. (8) **Uses of seed.**—Cotton seed is being more used now as a food for cattle and the people are, I believe, gradually beginning to see that it does pay to feed plough bullocks, so that the demand for seed goes gradually up, and the price has fully doubled since I have been in this part of the country.

(b) "Deshi" long staple cotton.

331. (10 and 11) **Experience and varieties.**—I have grown Hinghanghat, Tinnevelly, *buri* and Cambodia during the last ninteen years and have come to conclusion that the first three varieties cannot be grown profitably in Chhattisgarh since the higher price obtained does not compensate the grower for the reduced crop harvested whilst the fibre of *buri* is not sufficiently strong to render it really useful for spinning.

from experiments I have seen in these States, I am rather inclined to think that
some *very good*
am myself

es, such as
are the only

stapled cottons, I
parts, is suitable for
can be made in the
or less eliminated by sowing cotton on well drained soils such as *bhata* (porous
providing that cotton is available for irrigation after the *rains stop* and that *manures in sufficient* quantity can be obtained As regards water, it is of course for the Irrigation Department to see whether they are prepared to give water at a reasonable *rate for irrigation on such porous soil.*

331 (17) Prevention of mixing of different varieties —*As a manufacturer of yarn and cloth*, I would
India is to prevent the mixing of short and long stapled cotton
gentlemen who buy the cotton
sufficient to make it worth
growers to bring in their
own produce, since they do not grow
to pay them to bring it in themselves, and the *only way in which we check mixing* is by always paying for *kapas* at the market rate *for the lowest quality in the mixture, though this method as a matter of fact is not really satisfactory*, since, in many cases, I have noticed that the only result is that the growers of staple cotton get no more
the men who grow ordinary short staple
; and I do not think that ginning
to the owner, do mix cotton It

certain amount of good
reserve the seed for

(c) *Exotic cotton*

before I have *tried both American and Egyptian cotton,*
of the varieties tried were really successful, and
at any rate for this part of India.
Cotton Growing

and having seen these tree cottons grown for many
old—I believe that tree cottons, especially the
and I have expressed *this belief* in a short note,
written for the Agricultural Gazette of the
nces. The chief difficulties to be contended with *are :—*

(1) That the stems of the plants are brittle especially after the plants have been grown for some years.
(2) They survive the hot weather with difficulty, unless protected to some extent from the direct rays of the sun
(3) They are particularly subject to be attacked by stem borers

breaks, such as are employed everywhere in the south of France to
bushes are grown under light shade, something after
stems whitewashed, then a very profitable
perennials
her countries since it has
at, very often, new pests

COMMERCIAL ASPECT

not
names but against samples.

ed ginning factories in Amraoti, Chanda, Chhindwara, Kawardha
the mill, which I am unable to inspect often, employ *agents* to pay
bring in the carts to the factory Where there is a cotton market,

we draw samples from the carts and settle allowances on account of quality before taking the carts from the markets. The arrangements seem to work quite satisfactorily.

III.—STATISTICAL.

341. (33) **Improvement of cotton forecast.**—The cotton forecast of the Central Provinces has recently been very accurate, and I believe the difference between the forecast and the actual has not been more than about five per cent.

342. (35) **Publication of Liverpool and Bombay prices.**—It is not, in my opinion, necessary to publish Liverpool and Bombay prices in up-country markets. Every big dealer knows them and others very soon get the information.

IV.—MANUFACTURE.

(*a*) *Ginning and Pressing.*

343. *General.*—All our gins are Platt Brothers' single Macarthy gins. I have tried three other makes, but found them not satisfactory, so that I soon threw them out. We used formerly to bale cotton at all our factories except at Chanda. We have now however only kept on Chhindwara and Nandgaon factories, and, as we find it cheaper to transport our cotton in Australian woolpacks, the baling presses are not in use. Occasionally I have bought Saw Ginned Dharwar, but the quality of this variety has deteriorated and I no longer buy it. If long stapled cottons were grown in these districts, I should not require to make any substantial alteration to the machines.

(*b*) *Spinning and Weaving.*

344. (43) **Counts spun.**—We spin here from 2½s to 28s and 32s.

345. (44) **Condition of cotton.**—Cotton reaches us in good condition excepting that of course the tops and bottoms of bales from which the gunny is often removed in transit are very dirty, and, in the rains, we calculate on losing thereby about one per cent of the cotton.

ANNEXURE.

Note by Mr. C. E. Low, I.C.S., Director of Agriculture, Central Provinces, on a proposal to introduce cotton in Chhatisgarh.

Introductory.—I have long been of opinion that cotton, probably long stapled, could be successfully grown in Western Chhattisgarh. Efforts have been made since the year 1900 by the Central Provinces Mills, Rajnandgaon, in conjunction with the State authorities, to induce cultivators to grow cotton; but with very varying success. A few results have been strikingly good: but most were lamentably bad. Good cultivation in most cases seems to give good results. Failure is mainly due to bad cultivation, for which this tract is notorious. Efforts were concentrated too much in the south-western areas near Nandgaon, where the rainfall is higher. The Agricultural Department was not at that time in a position to give more than advice and occasional help; it could not control: nor at the time, when the greatest efforts were being made, was its staff sufficiently well trained to be of real help.

We now have a well trained and rather more numerous staff: we know a good deal more about cotton growing than we did: and I think the time has come when we should attempt to consider Western Chhatisgarh seriously as a field for cotton growing. That the most promising area is largely comprised in Native States seems to me to be of no importance.

Tracts visited.—In company with Mr. Clouston, Deputy Director of Agriculture, Southern Circle, and Mr. Frederickson of the Central Provinces Mills, Rajnandgaon, I visited the states of Rajnandgaon, Chhuikhadan, Khairagarh, Kawardha and the Zemindaris of Gondai, Takurtola, Silhati and Lohara, between the 3rd and 7th December. I had intended to go on to Pandaria, but, in view of the fact that I already know the Zamindari well, and that I was pressed for time, I did not do so.

2. *Existing cotton crops.*—I saw several fields of *buri* and Berar *jari* cotton at Nandgaon, grown by the Dewan. The appearance and probable outturn were highly satisfactory, the crop was sown in lines and looked clean and well grown. I also saw two small fields of cotton at Chhuikhadan grown by the Dewan, one of *buri* and one of *jari*. The first was perhaps the best *buri* field I have ever seen: and the *jari* also was a good crop. I saw several fields of indigenous cotton near Kawardha: it was grown broadcast, mixed with *tur*, which was usually sown in lines. It was scanty and not free from weeds: the ground was hard and ill cultivated. The outturn was roughly estimated at about 150 pounds. Inter-cultivating would enormously improve this. I saw a very fine field of *buri* at Niwari near Kawardha. The crop was pure and yield probably extremely heavy. There was a very fairly good crop of *jari* grown beside it. This seemed not to be manured. The *buri* was grown on *genura* (adjoining village) land. The cultivator was a local *gontia*. Practically all the good looking cotton was moderately well manured.

3. *Cotton samples.*—I saw samples of cotton at various places. Nearly all of it similar in character, a mixture, with a lot of *malvensis*, but all very poor, small and damaged in some cases by insects. In one case, I saw a mixture of *buri*.

4. *Area and occurrence.*—The crop is most plentiful round Kawardha, where the area carries from 4,000 to 6,000 acres, according to the year: in this State it is concentrated in the Western jungle. The crop is also not infrequent in Gondai, Lohara and Chhuikhadan, especially in the outlying portion of the latter State called Bortara. In one *patwari's* circle here as much as ninety acres are reported.

The favourite fields for cotton are slopes of second class black soil called *ghurri* and *dorsa*: also in *genura* (adjoining village) fields, and on old village sites (*dih*). Near the hills to the west, this type of rolling poor black soil is predominant and could all grow cotton. Further east, the land is flatter. The areas where cotton might be grown are at present cropped with *kodo tur*, often in rotation with wheat. *Kodo tur* is a very poor crop; and cannot yield more than Rs. 15 an acre. The wheat is of poor variety (mostly *kathia*), and ill grown. I doubt if it would yield more than Rs. 25 an acre.

5. *Previous distribution of seed.*—The Central Provinces Mills and the Agricultural Department have distributed *buri* and *jari* seed during twelve years past. The *jari* was not pure *roseum*, but the ordinary Berar *jari* containing all the ordinary mixed species with the exception of Upland Georgian. Pure *roseum* would give a higher yield than this *jari* and a very much higher one than the local mixture.

and a half
varied but
as lo v as six
The local
Marwaris buy the cotton and export most of it to Nandgaon This makes it difficult for the Central Provinces Mills to help the cultivators by giving good prices as the difference is mostly intercepted The Central Provinces Mills have a gin at Kawardha, but it is not working at present

7 *The rainfall* —The rainfall decreases towards the north and west I append a table—

	Inches
Khalsa—	
Mungeli	45
Bemetara	44
Simga	43
Pandaria	46
Feudatories—	
Khairagarh	44
Kawardha	38
Chhuikhadan	40
Nandgaon	48

8. *Economic history of tract* —The past history of the tract shows that it once grew a good deal of cotton especially round I
Jubbulpore to Mirzapur
Pandaria and West Bilasp

ensure a good price

this tract appear when decently cultivated to be superior to *jari* It would be impossible however to be certain on this point without experiment Perhaps comparatively well manured and cultivated fields might grow *bari* and the poorer ones *roseum*

the work done by
results have been
ment Agricultural
Central Provinces
rk The Rajas of
ork and are

relations are continued

11 *Future programme* —Our programme should certainly be as under (i) We should acquire a farm of some fifty or sixty acres to experiment on the best varieties and methods of cultivation to serve as an object lesson to cultivators and as a centre of our demonstration work and to produce seed for distribution

12 *Site and management of Farm* —The farm should be located in the tract most favourable
Sites in the
been offered
and the Raja
car a place of
general resort and will be distant by road some 52 miles from Tilda Station miles from Rajnandgaon and 72 miles from Raipur The whole area under consideration is a long way from the Bengal Nagpur Railway and no nearer site can be found but *the roads are quite practicable for motor car or motor cycle* If the Mandla Bilaspur Railway line is built, it will pass within a few hundred yards of the probable site of

the farm. It will be essential to place a thoroughly reliable man in charge as it will not be so easy to inspect this farm as our others. The supervision will rest with the Superintendent of Demonstration, Chhattisgarh, a competent but very hard worked officer: and the Deputy Director of Agriculture, Southern Circle, Mr. Clouston, to whom the two above epithets may be applied with even greater force.

13. *Probable date of starting.*—I could not possibly recommend the inception of the attempt to introduce cotton into Western Chhattisgarh, until a third Deputy Director of Agriculture arrives and relieves Mr. Clouston of the charge of the Berar-Nagpur-Wardha cotton area. When that has been accomplished, I think we should make a start, and I hope the result will be a useful addition to the area of land in India growing a long stapled cotton.

Mr. H. Frederickson, called and examined.

346. (*President.*) I have considerable experience of cotton in the Central Provinces, having been here for the last twenty years. I am manager of the Bengal Nagpur Cotton Mills, Rajnandgaon. My experience of tree cottons chiefly in Bengal and Bihar did not prove satisfactory. The land was unsuitable and more or less water-logged. The cotton was a complete failure, and after three years it was decided to abandon it as in those parts of the country it was not a commercial proposition.

347. We have only had very small quantities of *roseum*. It has not been grown largely in the Chhattisgarh division. It is a good cotton of low staple, strong and rough and spins 10s. to 12s. I used to see a lot of Hinganghat *bani* when I first came out but, it gradually disappeared. We had a factory at Chanda to buy Hinganghat *bani kapas*, but the people mixed it so much that it was no good buying it and we gave the factory up completely. We spun it up to 32s. weft. It ran up to an inch and an eighth in staple. I know the cotton called *buri*. It proved to be weak; the staple was all right, about an inch in length, but it was a weak cotton. The ordinary Nagpur cotton known as *jari* is all right for low counts. We spin from 2½s. to 32s. For the higher counts we import cotton from Madras. We cannot get any cotton locally to spin high counts. Some cottons grown near Akola spin up to 20s. From the cotton that comes from the Nizam's territory we can frequently spin up to 30s. I have not had much experience of *roseum*.

348. I only took up cotton growing when I came out to India. As to the possibility of growing long staple cotton in the Central Provinces, I do not think the climate or the length of the growing season is entirely against it. Cambodia would grow quite well under irrigation. In my written evidence, I said that one of the great difficulties in India was to prevent the mixing of short and long stapled cottons together. I am not referring to any particular cotton but to cotton generally. I was really thinking of the local cottons in the Central Provinces, for example Hinganghat.

349. (*Mr. Wadia.*) I had a factory at Chanda for which I used to buy Hinganghat *kapas*, but the *bani* was constantly mixed with *jari*. I think the mixing was done by the middlemen. In Chhattisgarh, *kapas* is collected by men who go round with carts to the various villages. Instead of keeping the *kapas* separate they mix it. In Chanda and Hinganghat, the mixing is also done by the sellers of the ginned cotton. We used to buy all our staple cotton in Hinganghat when I first came out. Now we do not buy any at all from Central Provinces. The ginning factories gin cotton both for themselves and also on commission. As to whether the mixing is done by the ginners who buy their own *kapas* and sell the cotton afterwards, my opinion is that the ginners mix it.

350. I do not think that there is much damping now done by the ginners. I think that the practice is dying out. It used to be more prevalent formerly. I have seen damping machines in several factories I have been to. There were regular machines for damping, a sort of beater for the purpose of loosening the cotton and sprays for spraying the water on the cotton as it came through, ready for the press. Damping was done both in the ginning and pressing factories. We still get a certain amount of cotton damped. I think that some people still damp the cotton purposely but less frequently than was formerly the case. I think this damping could only be stopped by inspection. I know two factories where damping was until recently done by machinery. Any inspector could see at once what the machines were used for. I think that factory inspection would stop such damping. If it cannot be stopped without legislation, then legislation must be introduced. I think that open damping like that should be stopped. It would be very difficult to stop people who just leave the cotton to be damped by dew and then take it to the market or press it, but systematic damping can doubtless only be stopped by legislation. To prevent malpractices on the part of the officers inspecting the factories, they would have to be paid sufficiently well to make it worth their while to be above such dishonest practices. I do not think there is much mixing of *kapas* with cotton.

351. If long staple cotton only were grown in Chhattisgarh, the seed would have to be distributed from Government seed farms in order to keep up the standard. I am inclined to think myself that the staple of cotton grows weak owing to the want of selection of seed and that, unless fresh seed is given out every now and then, the cotton is bound to deteriorate. I do not think that it is necessary to have seed farms over the whole of the province. The great need is of course to have the same cotton grown over a large block and then there can be no mixing.

352. I have had experience of ginning and pressing pools. My firm, Messrs. Shaw Wallace and Company, has been a partner in these pools, but not recently. We have not now got a factory in a place where there is a pool. My experience of these combines is that there is no real combine. Supposing there was a ginning combine which nominally charged Rs. 4 for ginning, all you have to do is to go round to all the ginning factories and to ask each of them what they will charge for ginning and you invariably get a rebate. It is no combine at all. The share of the profits which used to go to the pool was one-fourth. I do not think that these pools can be in the interests of the cultivators. They must result in the cultivators' obtaining a smaller price than they otherwise would. In many cases there are more factories than there is work for in a normal season. Many factories do not work at all, but get a share in the pool without working. Some factories have been started, not with an idea of working, but simply to share in the profits of the pool. I think you will find factories that have never worked even in a bumper season.

353. I think it would be a good thing if ginning factories and presses were licensed by law. I would certainly make it a condition of these licenses that, if frequent damping and mixing were resorted to, the licensee would be liable to forfeiture of the license. I would not go so far as to suggest that there should be legislation to stop pool monopolies. Nor would I advocate that where there are more factories than are necessary for a particular district and a man starts a new factory simply to share in the pool and with no other object, a license should be refused to him. I think there have been cases in which all the factories

do not join the pool occasionally one or two factories stand out If a factory stood out it would spoil the pool

Raipur with Cambod a
ise large quantities of
I have tried growing
hhattisgarh, I should

[illegible] would be released for export in view of the demand of the local mills

356 (*Mr Ashton*) I should think a reasonable rate for irrigation water on the porous soil of Chhattisgarh for Cambodia cotton would be about Rs 2 to Rs 3 an acre The land revenue there is very small Under the present arrangement, the cultivators get water free in the first year I think Re. 1 8 per acre *is charged for it in the second year I do not think that it will* stand a rate of more than Rs 2 to Rs 3 per acre The rate would have to be increased very gradually or otherwise the cultivators would be frightened of cotton Of course, when they get used to cotton and if profits are high, they would be able to pay a higher rate The main crop is rice the cultivators would rather grow rice than cotton

the most that we had in a year My impression is that it got weaker each year as the seed became

[illegible]
and he sells it in small
with better yield and
it In Amraoti, the
If an improved cotton
to a mill i e to a mill

were brought in it woul
which had its own gins

361 I should like to say something abo
We tried them but we tried them on water l
that the stems are very brittle because
protected by wind breaks Another is that

silky fibre.

Rai Sahib BHAIYALAL DUBEY, L Ag, Acting Deputy Director of Agriculture, Western Circle, Central Provinces

EXAMINED AT AKOLA ON NOVEMBER 16TH 1917

Written statement

I — AGRICULTURAL EXPERIENCE

(a) *Deshi' short staple cotton*

362 (1) Experience — I have been stationed at Nagpur and *Akola for about four and eleven years* respectively During the latter period by nature of my duties as a member of the Central Provinces Agricultural Department I have been in continuous touch with cultivators of important cotton growing districts, viz, Nagpur, Wardha, Yeotmal, Amraoti Akola Buldana and Nimar

363. (2) **Varieties.**—The kind of cotton now grown in the above-mentioned districts is a variable mixture of yellow and white flowered plants commonly known as *jari, gaorani, katil, kativilayati* or *hauri* in different parts. The mixture consists of as many as six distinct cottons, *viz.*, Upland Georgian (*hirsutum*), *bani* (*indicum*) and four *neglectums*—*roseum, roseum cutchicum, malvensis* and *verum*. The first and the last two are considered inferior types from the monetary point of view, and are, therefore, being gradually eliminated.

(2) From experiments on Akola Farm from where improvements in cotton cultivation of these Provinces emanate, *roseum* proved to be the most paying and has therefore been recommended by the department which, to start with, arranged for its extensive trials with private land-owners in all the districts. Their experience has also been convincingly in its favour. A considerable area is now grown with it. Last year according to my estimate it was grown in about 700,000 acres.

(3) A yellow flowered type resembling a mixture of *malvensis* and *verum* is making a little headway for such lands as are badly infested with cotton wilt. It is known as *vishnuri, sambhri* or *shenderjana* in different localities. The variety is not grown because of its merit but because it is said to be immune to wilt disease. The Akola Farm has started trials to test the said immunity of this cotton and by next year we shall be able to form an opinion about it.

364. (3) **Size of holdings.**—The average size of holdings in the tract is about twenty acres, and fifty to sixty per cent. of the holding is put under cotton.

365. (4) **Yields and profits.**—The average yield of *jari* cotton is 280 lbs. of *kapas* (seed cotton) and the average net profits from it amount to Rs. 20 per acre. Experiments on Akola Farm show an average outturn of 438 lbs. of *jari* and 500 lbs. of *roseum kapas*. In other words there is an increase of fourteen per cent. in the outturn of the latter. Taking this as the basis, the net profits by growing *roseum* cotton are Rs. 30 per acre. The difference in net profits in favour of *roseum* is Rs. 10 (Rs. 30—Rs. 20). Half of this increase in the net profits is due to increased outturn per acre and the other half to the higher ginning percentage. The prices of the current season would raise the net profits on average yield to Rs. 39 and Rs. 54 for *jari* and *roseum* respectively. But reduced to the season's actual outturn (200 lbs. of *kapas* per acre), the profits would actually amount to about Rs. 23 for *jari* and Rs. 34 for *roseum*.

The following table compares the average profit per acre from different crops :—

Name of crop.	Net profit per acre.	Average outturn of kapas per acre.	Ginning percentage.
	Rs.	lbs.	
Jari cotton (*deshi* short staple)	20	280	34 per cent.
Roseum cotton (*deshi* short staple)	30	319	40 "
Bani (*deshi* long staple)	13	230	26 "
Buri (exotic)	18	222	34 "
Upland Georgian (exotic)	5	186	28 "
Malvensis (*deshi* short staple)	17	269	31 "
Verum (*deshi* short staple)	16	261	33 "
Wheat	14	..	..
Juar	15	..	..
Gram	10	..	..

366. (5) **Rotations and manures.**—Generally cotton is rotated with *juar* which is the staple food and fodder crop. People owning large holdings put a small part under wheat, gram, linseed and other minor crops. They recognise the value of rotation with leguminous and other crops by which cotton fields for the succeeding year are better prepared. But useful rotations generally are not adopted because they are less paying and specially the *rabi* crops do not yield satisfactorily on account of short rainfall. *Tur* (*Cajanus indicus*) is grown as a mixed crop with cotton in the proportion of one to two lines of *tur* to eight to twenty lines of cotton. *San* hemp is known to be a good rotation crop, but its cultivation is restricted only to limited areas in certain parts. Want of water for retting and of labour for extracting fibre are the complaints against it. Groundnut is a new introduction and can serve as the best and most paying rotation crop for cotton. It has been grown successfully on the Akola Farm and efforts are being made to extend its cultivation.

(2) Cattle dung mixed with house sweepings and ashes is the only manure in common use. Its value is appreciated almost throughout the cotton tract and its selling price is from eight annas to two rupees per cart load of ten maunds. Poudrette is a very good manure for cotton and can be available in considerable quantities near large towns, but caste prejudices come in the way of its being used to an appreciable extent. Folding sheep, when available, is practised in some places. Artificial manures have not yet been taken up

and cattle urine, which is of the same manurial value as their solid excreta, is also neglected. The following table shows comparative merits of some useful manures for cotton tried on Akola Farm

Name of manure	Outturn of kapas per acre
Cattle dung	532 lbs
Cattle urine	575 ,,
No manure	321 ,,
Cattle dung	396 ,,
Poudrette	493 ,,
Saltpetre	409 ,,
No manure	301 ,,
Cattle dung followed by top-dressing of nitrate of soda . .	650 ,,
Cattle dung followed by top dressing of nitrate of saltpetre . . .	636 ,,
No manure	317 ,,

367 (7) **Conditions affecting increase in area.**—Ordinarily the cotton area does not fluctuate much With favourable season and high prices, people are encouraged to grow more cotton and there is a slight increase on this account. The nature of season at sowing time also determines the increase or decrease in cotton area. All suitable and available area is put under cotton and it is not likely that the increase can be considerable It has perhaps reached the maximum. There is however, a good scope for increase in quantity from the present area by improved seed, better rotation better tillage and more manure

368 (8) **Uses of seed and seed selection** —The seed is fed to cattle and large quantities are exported A very small quantity is used for extracting oil in the Akola Oil Mills. Some years ago a few cotton growers used to select the *kapas* for seed purposes by getting fluffy bolls picked separately from cotton fields, bu

from one

gin it for

of lint

use, are

from fact

the lint does not fetch as good a price

(2) Seeing that no proper system of seed selection is practised and also with a view to propagate the seed which is worth pushing, the Department organized the system of private seed farms and it has proved to be a success. Plant to plant selection is followed every year on the Akola Farm and seed propagated from the most desirable plant is given from year to year for being sown in the seed farms varying in size from ten to fifty acres. The private owner carefully cultivates the crop under departmental supervision and

369 *Agricultural Seed Unions*.—After some years experience, it was found that to secure large

quantit

were th

Union

produce

distribu

370 (9) General economic conditions —The

Provinces and its prosperity is attributed to the cotton crop which during the last 25 years has received

particular importance on a

communication and marke

people to put more area u

which he can free himself

Co operative societies can do much good in this direction They provide money at cheaper rates of interest and help to educate members for being better business men Primary education followed by *technical training is sure to improve the economic condition* Labouring classes in the cotton tract earn high wages and are on the whole well off

(*b*) '*Deshi*' *long staple cotton*

371 (11) **Varieties.**—In fact, no *deshi* long staple cotton is grown in the important cotton districts of the Central Provinces *Bani*, known as the Hinganghat cotton, used to be grown three or four decades ago,

but the introduction of the hardier type known as *jari* has altogether replaced it by this time. Even up to ten years ago, we could trace *bani* in the southern parts of Berar growing pure in some fields, while in others it was found mixed with *jari* in large proportion. The climate of the southern plateau of Berar is more favourable for the growth of *deshi* long staple cotton (*bani*), but even there its yield is less than that of *jari*. The parts nearer the railway line took up the hardier type early because the seed was available close to them. The cause of the late introduction of the hardier type in the southern parts is attributed to their remoteness and the difficulty of transport and consequently cultivators there were not in closer touch with this new seed. As we go still further south, *e.g.*, the Nizam's Dominions, we come across pure *bani*. The *bani* cotton coming to the Akola bazaar is known as *dhanki*, but its reputation has much suffered during recent years.

372. (12) **Conditions effecting increase in area.**—*Roseum* is more paying than *jari* and much more so than *bani*. The last being the only *deshi* long staple cotton is not being pushed. Had it been even worth pushing, the length of ginning season and climatic conditions would not help much. Useful rotations can certainly be of some help, but the present crops suitable for the purpose are less paying and they therefore cannot replace considerably cotton where it is grown from year to year. So far there has been no project for irrigation works in Berar, nor there is likelihood of any in the near future, but if it be possible to have any such project for canal irrigation in some part of Berar, I am sure it will be very popular. It will surely not help the cultivation of *bani*, but the exotic cottons like *Cambodia* and *buri*, I think, can be grown successfully under irrigation, provided that the land is richly manured. *Bani* has small bolls and the *kapas* cannot be picked out so easily and consequently labourers do not prefer to do its picking by contract which is the prevalent economic practice.

(c) *Exotic cotton.*

373. (20) **Varieties.**—The attempts made in the past towards the introduction of exotic cotton have not met with any success. In 1908, the seed of *buri* cotton, a type of *Upland Georgian* which was acclimatized in Bihar, was tried on the Akola Farm and seemed to be a promising stapled variety for introduction in these parts. Extensive trials were made in all the districts and their net result was that it could not compete with *roseum*. Though later, it is superior to *Upland Georgian*, inasmuch as its plant is hardier and more prolific. The ginning percentage is also higher. Both the varieties are immune to wilt. They suffer from leaf blight in the months of September and October when most of the leaves turn reddish brown and fall off. The young bolls, buds and flowers also fall down. If *buri* cotton is favoured with late rains, fresh leaves, flowers and buds appear by the end of November with the advent of cold, provided that the soil is heavy, retentive of moisture and richly manured. This late crop in favourable seasons helped with cold weather showers may give pickings up to April, and I believe the outturn will be quite satisfactory under the conditions mentioned above, but the individual plots in which these conditions are obtainable will stand by themselves exposed to ravages of stray cattle after the local cotton is harvested.

374. (27) **Prevention of mixing of different varieties.**—The owners of seed farms and members of Unions grow only one type in their whole cotton area from which they weed out alien plants, if any, at the time of flowering. The cotton picked is stored and ginned carefully either in small ginning plants set up at the recommendation and with the help of the Department or in ginning factories which are carefully cleaned of foreign seed before ginning the Union or seed farm cotton. The former is however a more satisfactory arrangement. The extension of this system will prevent mixture creeping in fields. Encouragement in the co-operative sale of produce only to selected and fair dealers would, in my opinion, prevent the mixture in the factories.

375. (28) **Importation of seed.**—Acclimatised selected seed is better than the fresh imported seed because the latter does not at all do well for the first three or four years and also because of the uncertainty of the type we may get from year to year.

376. *Recommendations in regard to research.*—In my opinion, there is yet some scope for research work in exotic and *deshi* long staple cotton :—

(i) A suitable type may be secured by seed selection or by hybridization.
(ii) Suitable manure or mixture of manures may prove helpful.
(iii) About the most suitable and economic cultivation for exotics much is not yet known.

Large areas in the northern districts of the Central Provinces may be found suited to grow the exotic like *buri* with improved methods of cultivation and manuring.

III.—STATISTICAL.

377. (33) **Improvement of cotton forecast.**—Allowing for the difficulties in forecasting the yield of this crop, the cotton forecasts published in these provinces are fairly accurate since the Agriculture and Land Record Departments co-operate to frame the forecast.

V.—GENERAL.

378. (46) **Attitude of buyers to improved cottons.**—Regarding the premium on the prices of long staple cottons, my own information is that no buyer has yet come forward to offer premium to encourage the growth of stapled cotton. When the Department tried to push *buri* in the first year, it got the premium value of fifty per cent. more than that of local cotton. After three years, when the area under this cotton extended to 6,000 acres it could secure only twenty per cent. more chiefly because its staple had gone weaker and then it was less paying than either *jari* or *roseum*. The people were thus discouraged to grow and now have given it up entirely.

379. (49) **Effect of tenure of land.**—The tenure of land is not at all obstructive to cotton cultivation in Berar where the tenant is in fact a proprietor of the holding. He can thus safely spend on the improvement of his holding. He has sufficient credit to raise money, if necessary, on the security of his land. In the Central Provinces districts, the conditions are quite different. The ordinary and occupancy tenants there have not the same privileges of dealing with their holdings as in Berar.

Rai Sahib BHAIYALAL DUBEY called and examined.

380. (*Mr. Roberts.*) In my written statement, I have given the net profits per acre of the various types of cotton. This calculation is arrived at by taking the gross outturn and deducting the cost of cultivation.

The cost of cultivation is uniform throughout. It is the same in the case of *jari*, *buri* and *roseum* I have given the outturn figures on which it is based in the third column of the statement. *The average outturn of jari is for the last five years and represents cultivators' average The figures for other types are in relation to this average* *Buri* yields less *kapas* than *bani*.

381 The figures in the statement in paragraph 366 are the results of ten years' tests on comparative plots. The experiments with manure have all been made on *roseum* I have made no experiments to

potential yielding power.

382 I

exotic cott

and three

with manu

knocked of

some moisture

rown. It is

Ordinarily

than Upland Georgian. Upland Georgian still exists as mixture in *deshi* cotton. A careful cultivator prefers to eliminate Upland Georgian at the time of weeding The cultivators do not like this type and when any attempt is made to eliminate undesirable types, Upland Georgian will be eliminated first and altogether The seed is ginned in factories and a lot of mixture goes on in the factories. The area under cotton in Berar is about thirty lakhs of acres It is very difficult to say what is the highest area of American cotton that we

it is worse than in the southern parts. It is especially prevalent in rich and heavy soils It has also been attributed to heavy manuring

the area under cotton. Of course the cultivators

they have sown Upland Georgian in fifty acres, in a village called Moha where the land suffers very much from wilt. In other cases cultivators are trying another variety called *vishnuri* It appears to be a mixture of *verum* and *malvense* but our experience is that it is not entirely wilt resistant. It is apparent from the trend of my evidence that even in the Moha village of the Yeotmal District one could put out an American type which would be much better than the Upland Georgian. *Buri* is a much better type than Upland Georgian. with

Upland Georgian th seen

wilt attacking *them* some

conditions under which exotics can be grown are not exactly known We have got waterlogged areas We know that *buri* stands waterlogging better than *roseum* *Buri* might do better than *roseum* in patches here and there but there are no continuous tracts in which it would do so

flowers are concerned

the way I will describe We select from one *line three* of bolls Originally

plants and the seed of retained and the rest rejected from of those lines would be

the

that

the following year. From the branch farms it goes to the cultivators. It thus takes eight years for seed from our original selection to reach the cultivator.

388. (*Mr. Henderson.*) I do not know if, in the opinion of the cultivators, the quality of *bani* is going down every year, but it is certain that they do not like to grow it. At one time Hinganghat *bani* was famous. I cannot give definite figures as to what the yield of *bani* used to be. I heard the opinion expressed yesterday that, in old days, the yield of *jari* was 200 lbs. and of *bani* 127 lbs. per acre. In the old days when Hinganghat *bani* was famous, in the parts in which *bani* was grown, *jari* was not known. *Jari* was grown at that time in Berar but from the description the people give of it, we know that this *jari* was different from and superior to the ordinary mixture now commonly known as *jari*. The mixture in Berar is known as *kati vilayati* and it must have come from Khandesh and gradually made its way towards Hinganghat. We find *bani* still grown in the Nizam's dominion and the chief reason for this is that the people there have not yet either been able to secure the seed of *roseum* or of *kati valiyati* or do not know about it. I came to Berar in 1906. At that time, the *bani* that used to come in to the Akola bazaar from the Nizam's dominions was pure *bani*. Now we find all kinds of mixture though there is a high percentage of *bani* in it but the pure *bani* carts that we get now are very few; it is only from Dhanki and other parts in the Nizam's dominion that we get pure *bani*. They grow *bani* in the Nizam's dominion only because they cannot get any other seed. The people who come to sell their *kapas* here, see the local or *kati vilayati kapas* in the market and they take away some seed from here and gradually it is spreading there too. I think the *bani* from the Nizam's territories is the same as the old *bani*. As to whether it is as good as Broach, I have not much experience of Broach cotton but the *bani* at present is as good as it used to be, as the old men say that it is giving the same outturn as it gave then.

389. The figures in my written statement relate to net profit per acre over ten years but of late the price of *buri* has gone up. It went up last year. In view of the price of staple cotton, it is quite possible that the price of *buri* will go even higher which might give a much more favourable aspect to *buri* cultivation. The price per maund of *buri kapas* to enable it to compete with *roseum* would have to be about Rs. 13 as compared with *deshi* at Rs. 8 per maund. At the present price of Rs. 16 per maund for *deshi kapas*, *buri* would have to be Rs. 24 per maund. The basis of the calculation in my written evidence is this: from our reports, it can be found that certain cottons were selling at certain prices; for instance, in 1913-14, *roseum kapas* was sold at Rs. 65 per *khandi* of 560 lbs. *Jari* was sold at Rs. 103 per *bhoju* of 345 lbs. of lint. *Bani* was sold at Rs. 125 per *bhoja*, *malvensis* at Rs. 107, *verum* at Rs. 107, *roseum* at Rs. 105 and *buri* at Rs. 133. We took the average of nine years.

390. As to the number of centres in which we had comparative trials of *bani*, *roseum* and *buri*, we have not tried *bani* since 1904-05 because in 1904 and 1905, we had distributed large quantities of *bani* seed and without any exception, the results were unsuccessful. *Buri* trials were started in 1908. Tests were made on the central farm. There were only three or four seed farms originally. Seed was given out to five or six seed farms. There were only one experimental plot and some non-experimental areas in which *buri* was grown. The tests were carried out for two years. After the second year, seed was given out to the seed farms and the results were compared. It might have been better if more exhaustive tests had been carried out. I cannot definitely say whether *roseum* would be the best type for the Nizam's dominions.

391. Most of the cotton in Berar is grown without manure. I have gone into the question of leguminous crops to take the place of manures. I would recommend small Japan groundnut as the most suitable leguminous crop for rotation with cotton. I have not tried experiments with other leguminous crops such as *matki*. *Matki* is an inferior crop and grown only on very light soils. The limiting factor in Berar is largely one of manure. The difficulty of introducing rotations of leguminous fodder crops is that those crops would not pay. We made some trials with Raipur local groundnut but we found that there was difficulty in regard to labour for lifting the crop. We tried soy bean for fodder. We did not feed the cattle on the ground. We collected the crop and turned it into *bhusa* (fodder). I do not think there is any leguminous crop except groundnut which could be used as a suitable rotation with cotton. Other crops are not sufficiently paying.

392. Last year we got very little *buri* and that was inferior. This year *buri* has yielded very well and the quality of the cotton is good. In 1911-12, we had six thousand acres of *buri*. For the *kapas* the cultivator would have got only the same price as the local cotton. We therefore made special arrangements to collect the *kapas* at one place; it was ginned separately and the lint was sent to the Empress Mills, Nagpur.

393. I have had some experience with American types. In Mr. Mollison's time, we tried various types of Upland Georgian. Some thirteen to fourteen types were tried. *Buri* seemed to be the best. I have had no experience of Dharwar American. As to Punjab American, I do not know whether the seed came from the Punjab, but we got some seed from Kabul eight years ago. It might have come through the Punjab Government.

394. (*Mr. Wadia.*) If the price of *buri* went up to Rs. 160 per *bhoja* of 345 pounds, I still do not think it would pay the ordinary cultivator to grow it but those who were enthusiastic about it might grow it. The yield of *buri* on unmanured lands is only about 120 lbs. per acre. Rich lands might yield up to 500 lbs. per acre. The figures in my written evidence are for fair land. *Buri* will not grow on light soils. The cultivators of heavier lands might take to it if the prices went up but the cultivators of light land will not grow it. When the premium on *buri* went up to fifty per cent., the area went up to 6,000 acres but it fell again when the premium dropped to twenty per cent. At present, lint of *jari* (local cotton) is being sold at Rs. 440 per *khandi* of 784 pounds. The Nizam's State *bani* grown in Parbhani and its neighbourhood is fetching Rs. 590, and there is therefore a difference of Rs. 150 per *khandi*. *Buri* cotton lint will fetch about the same price as Parbhani *bani*. If prices were favourable, there would be a considerable area under *buri* but all cultivators would not take it up. Large quantities of *bani* and *buri* could be grown in Hinganghat if prices were still more favourable.

395 *Roseum* and other varieties of *neglectums* as well as *bani* are liable to wilt whereas *buri* and Upland Georgian are immune. *Buri* and Upland Georgian are however liable to leaf blight, which does not attack the *neglectums*.

396. The growing season for local cotton lasts from July to October. We sow from the middle of June to the first week in July. It is a four months crop. The picking begins at the end of October and goes on to the middle of December but if the rains are favourable, it sometimes continues up to January. The shortness of the growing season is one of the difficulties in the way of long staple cotton. We do not get frosts. The lowest temperature in December and January would be about sixty degrees but sometimes

it is less By shortness of growing season, I mean that there is no sufficient moisture in the soil in December and January.

397 The most ordinary rotation is cotton after *juar* Cotton after wheat, gram or any other *rabi* crop is better than after *juar* Cotton after wheat is not a common rotation On account of short rainfall, wheat does not pay the cultivator *Juar crop is taken after cotton Juar is sown in* July and then the field is put under cotton the next year. Both *juar* and cotton occupy the field *for one complete year.*

Rai Sahib GANESHDAS KUNDANMAL of Amraoti.

EXAMINED AT AKOLA, NOVEMBER 10TH, 1917.

Written statement (Translation)

I.—AGRICULTURAL EXPERIENCE.

(a) "*Deshi*" *short staple cotton.*

398 (1) **Experience**—I am a resident of the Amraoti District I am in actual touch with cotton cultivation.

of land fit for

s per acre, after

'on, alternately,

and in *rabi* land, wheat, or gram or linseed and cotton All fields are not manured, but whenever manure is applied, it generally consists of cow dung

403 (6) **Comparative returns.**—Long staple cotton requires a greater amount of rain, and as we have got less rain during recent years, this crop does not yield a good return Hence short staple cotton is

price would be sown instead

405 (8) **Uses of seed and seed selection.**—The seed is generally used for feeding cattle, and a quantity of it is exported for the purpose of extracting oil from it Generally, no seed selection is practised on a large scale, but some cultivators remove seeds of the *tapri* variety and others weed out the plants Some

(b) "*Deshi*" *long staple cotton*

407 (11) **Varieties.**—*Long staple cotton is generally never sown in the* Amraoti District *Formerly,* a variety of long staple cotton called *bani* used to be sown, but it is no longer used, owing to want of sufficient rain in recent years There is no other *deshi* variety of long staple cotton More remarks on this point are unnecessary.

(c) *Exotic cotton*

408 (21) **Varieties**—*Roseum* and *buri* are the two varieties sown in the district *Only a very small* quantity of these varieties is grown The quantity of exotic cotton sown in the district is about one per cent of the total quantity grown there

409 (23) **Comparative returns.**—If there be more rain, the *roseum* variety does not yield a good return If the rain be moderate, the average yield per acre is about 280 lbs The *buri* variety is rarely sown, and its yield is less than that of *roseum,* as it does not get sufficient rain Its yield depends on the amount of rain Hence it is difficult to say what the yield per acre would be about one third of the total yield represents the profit of the cultivator. The proportion of this variety to *deshi* short staple cotton is less than one per cent

the growth of *roseum* will depend upon

farms Seed is not properly

take proper care in selection

of the seeds, and the price

l sale If we want to grow

ne market, and it must be

od crop in this district The

cnnot be answered at present

re convinced that a parti

dly necessary to weed out the

upervision from cotton grown

II.—COMMERCIAL ASPECT.

411. **(30) Local trade customs.**—It is not generally necessary to have an agent or make an advance or to enter into an agreement that the cotton will be purchased at a certain rate in regard to the marketing of the cotton crop. In a few places, an advance is given and at that time an agreement is made that the cotton will be purchased after so many days and at such and such a rate. This custom prevails here and there in villages, but it is lessening day by day.

415. **(31) Standardization of commercial names.**—The five grades of cotton are superfine, fine, pakka, fully good, and good, and they all come from this district. These names alone are convenient. There appears to be no necessity to alter them. These names are in vogue in almost all cotton-producing provinces, and it does not appear necessary to alter them.

416. **(32) Buying agencies.**—The existing system of buying through brokers and agents appears to be satisfactory. But the appointment of these brokers and agents rests in the hands of the cotton market committee. It appears necessary to make a little change in it and it is as follows. At present any person who likes can become a broker or an agent by paying a fee. Because of this all brokers and agents cannot be said to be capable and reliable, with the result that sometimes the merchant and sometimes the seller suffers loss. Therefore, before issuing licenses to these persons, their fitness for the work should be determined by a committee consisting of some merchants and some members of the cotton market committee, and those who are approved by it should receive licenses. This will suit the convenience of both merchants and sellers much better.

III.—STATISTICAL.

417. **(33) Improvement of cotton forecast.**—The estimates based on the cotton forecasts published in our province are generally correct, and there appears to be no necessity to make any improvement in them.

418. **(34) Improvement of other statistical information.**—In my opinion, the information available at present is sufficient.

419. **(35) Publication of Liverpool and Bombay prices.**—In my opinion, the daily publication of Liverpool and Bombay cotton prices is suitable.

IV.—MANUFACTURE.

(a) *Ginning and Pressing.*

420. **(36) Type and number of gins and presses.**—There are 48 gins, Platt Brothers' type and one press, type Fawcett Preston and Company, in my factory.

421. **(37) Size of bale.**—The size of the bale produced in my factory is 4½' × 1½' × 1½'.

422. **(40) Factory labour.** Difficulty is sometimes experienced in getting factory labour.

423. **(41) Condition of cotton.**—Most of the cotton reaches me in good condition, because such cotton fetches a higher price, and therefore the cultivators take precautions in bringing it. Only in unavoidable circumstances, does the cotton not reach me in a good condition and there is no remedy for it.

(b) *Spinning and Weaving.*

424. **(45) Effect of replacement of short staple cotton by long staple.**—There will be no effect on the cotton market. The condition which prevails in the market when short-staple cotton is received will also continue if long-staple cotton is received.

VI.—IRRIGATION.

425. **(71) Cropping and causes affecting it.**—Out of 100 acres, sixty are devoted to cotton, thirty-two to *juar* and ten to other miscellaneous *rabi* crops. If there be ample water, the sowing of *rabi* crops will increase to twenty per cent. There will be no particular change in crops if a necessity for fodder is felt. First *karbi* will be sown for fodder and the sowing of *juar* will increase ten per cent. The crops sown in rotation will be *juar* and cotton.

426. **(73) Deshi *versus* American cotton.**—In my opinion, cultivators prefer the country cotton to American cotton, because the American cotton needs more rain, and, if there is not sufficient rain, the crop fails. Therefore they do not like American cotton.

Rai Sahib GANESHDAS KUNDANMAL called and examined.

Translation.

427. (*Mr. Wadia.*) I am a ginner as well as a cultivator. I cultivate my own land. I have about five to six thousand acres of land. I cultivate about five hundred acres myself, letting out the rest to tenants. I have a cotton gin at Amraoti with forty-eight gins. I have also a press. Out of the five hundred acres of land that I actually cultivate, three hundred acres are under cotton.

428. (*Mr. Roberts.*) I am connected with a Seed Union. My brother is the chief man in the Union. I look after the gins and the cotton trade is my business. My brother looks after the Union which is in a village twenty-five miles from Amraoti. I can give evidence in regard to cotton, but I do not know much about the working of the Unions.

429. My experience of *buri* is that it does not yield as much as *roseum* on any class of soil in a dry year. I have grown it myself on seven or eight acres for two years and then I gave it up. The reason why there is a large proportion of Upland cotton in the *jari* type is that the seed is not selected and that is the reason for its existence. The ordinary seed the *zamindars* use is a mixture. A system of seed farms will ultimately eliminate Upland from the local mixture. I think that if the present number of Seed Unions continues to work it would take ten years, before there was nothing but *roseum*, but it would take less than this if the number of the Unions is increased. If the department introduced a cotton which was rougher than *roseum*, but yielded more, cultivators would take to it. It would not fetch the same price unless it had as high a ginning percentage. The price depends on the ginning percentage. The lint of longer staple cotton gets a better price but if the *kapas* is sold in the bazaar, the *kapas* giving the higher ginning percentage gets the higher value. My experience is that Rs. 4 more is paid per *bhoja* of 340 lbs. of *roseum* lint than for the ordinary *jari*.

nas no
Up
cotton
sown
tinued
for so long a time simply for the reason that the cultivators have not selected their seed

431 (*Mr Wadia*) My ginning factory is at Amraoti I do not keep *jari* and *roseum* separate They are mixed together I do not water my cotton Four or five years ago I used to damp my cotton but for

that no damping is done now

Government farms Seed cannot be satisfactorily produced by seed farms or Unions All men are not honest in the Unions. It is likely that Union members may mix other cotton seed with *roseum* and sell the seed as pure Out of six people, one or two might do that I believe in Government farms and think they are better than Seed Unions.

persons.
of Rs 60
When a
ations I
ld pay the
as dishonest

these returns

Rao Sahib BALWANTRAO RAMCHANDRA LANDGE, Izardar, Sonvadhona, Yeotmal

EXAMINED AT AKOLA, NOVEMBER 10TH 1917

Written statement

I —AGRICULTURAL EXPERIENCE

(*a*) "*Deshi*" *short staple cotton*

nce my childhood I was
I have been living in the
cotton cultivators but I

verum ghogli or Upland

about 25 acres of which

ad the average profit is
xpenses

440 (5) Rotations and manures — In a newly broken soil *til* is first sown and next to it cotton and *tur* The general rotation is that cotton is followed by *juar* and other cereals and then cotton again

he
ne

ies
ate
ad,
ed
ld
ut
ilt

is
of
ild
ity

is found out, the difference in prices ...

443 (8) Uses of seed and seed selection —Cotton seed is used for feeding the cattle and sowing The surplus which is a very big one is exported mainly, as I understand for extracting oil If at all any selection is practised it is on the principle of introducing a particular variety only Generally machine ginned seed that is not crushed much is selected for sowing It is only in very few exceptional cases that they select hand ginned seed

444. (9) **General economic conditions.**—All long stapled cottons tried up to this time seem to be late varieties, while *roseum* which is most profitable of all the mixed varieties of *deshi jari* is an early one. Rainfall in the country being uncertain, early varieties are preferred most. Besides in introducing long stapled varieties the dates of payment of Government money will have to be changed. The present dates suit only in cases of early varieties. As far as my knowledge goes, the present system of purchasing cotton or lint is defective. No distinction seems to have been made with reference to quality of lint but to quantity only.

(b) "*Deshi*" *long staple cotton.*

445. (11) **Varieties.**— For the present no specific variety of long staple cotton is grown in the districts with which I am acquainted. There are, however, some fields and those too very few where Upland Georgian seems to have been sown as the next best because *roseum* is found to be impossible to grow on account of the soil being extremely affected with wilt.

446. (13) **Yields and profits and comparative returns.**—As I have had very little experience of different varieties of exotic cottons, I am not able to give their average yield and profits but they don't compare favourably with the *deshi* short staple cotton except *buri* of which the yield may come up to that of *roseum* in very favoured localities, but the percentage of lint is about six per cent. less. The yield of the *deshi* long staple cotton is much better than that of Broach *deshi* long staple variety in this part of the country but is in no way better than *buri*, another exotic long staple variety. It compares favourably with other *deshi* crops of cereals in favoured localities unless heavily damaged by rain as this year or the prices go very low as three years ago.

447. (14) **Rotations and manures.**—For the present cotton is sown after cereals. Farmyard manure is the principal manure used at present. It is only those cultivators that are in close touch with Government farms who use nitrate of soda. But that is found impracticable on account of the prices having gone very high on account of war.

448. (15) **Conditions affecting increase in area.**—I do not think, under any circumstances, that the *deshi* long staple cotton *bani* will become popular.

449. (16) **Suitability of existing varieties.**—As far as my knowledge goes, I can say that nothing is being done in the direction of pushing the *deshi* long staple cotton.

450. (17) **Prevention of mixing of different varieties.**—I need recommend no measures to prevent the mixing of *deshi* long staple cotton with (i) *deshi* short staple cotton, (ii) exotic cotton, as there is very little *deshi* long staple cotton in existence. If there is any it can be prevented by opening seed farms but it will have the effect of altogether doing away with that variety and bring *roseum* or *deshi* short staple to greater prominence. It is very difficult to separate mixed varieties in the factories. They can be separately ginned only when they are brought separate and that too in small ginning factories.

451. (18) **Uses of seed and seed selection.**—The seed in mixed quantities is used for feeding the cattle or sowing in fields. The surplus is exported. No selection of seed is practised in the case of *deshi* long staple cotton.

452. *General.*—About twenty years ago when I personally began to look after my farm, *deshi* long staple cotton seed in greater quantities mixed with other varieties was sown. But the mixture when sold raw brought less price than the cotton with less mixture of *deshi* long staple and when it was ginned, the percentage of lint was very much less, so that I had to give up that variety and take to another one. I therefore think that regeneration of *deshi* long staple is an impossibility.

(c) *Exotic cotton.*

453. (21) **Varieties.**—No exotic cottons are grown in the district with which I am acquainted except on the Akola agricultural farm.

454. (23) **Comparative returns.**—The only exotic cotton I can say something about is *buri*. It is not so paying as the *deshi* short staple cotton *roseum*, but it compares favourably well with *deshi* long staple cotton *bani*. Under specially favoured circumstances and localities it compares favourably well with other *deshi* crops, *juar*, wheat, etc.

455. (25) **Conditions affecting increase in area.**—The increase in the area of exotic cotton *buri* can only be effected under irrigation as the rainfall is rather uncertain. The ginning season is sufficiently long till the middle of June. The climatic circumstances in the two districts must remain the same. It can compete with food crops under special circumstances only. As *buri* is not wilt affected, I don't think the principle of rotation of crops will have to be strictly followed as in the case of *roseum.* The difficulty of labour supply is the same in the case of *buri* as *roseum*. No effort is being made to push the cause of the exotic varieties of cotton.

456. (27) **Prevention of mixing of different varieties.**—If the exotic variety *buri* has to be pushed on, the mixing of cotton in the fields can be prevented by opening seed farms. If this variety is kept quite free from mixture in fields, it can only be kept pure in factories by getting the cotton ginned in small factories only.

457. (28) **Importation of seed.**—Seed of exotic cotton will have to be imported from America or Egypt till the quantity is sufficient and till the variety is acclimatised. After that selection of seed will, I think, be quite enough to serve the purpose of producing long staple cotton in India.

458. *General*—Rainfall in the two districts being uncertain irrigation is, I think, a necessary item for the production of long staple variety. But as irrigation is a very difficult question to be solved at present, trial may be given to the long staple cotton *buri* at least in good soil richly manured and in order to induce people to take to *buri* sowing again, good temptations by way of special concessions, prizes and bonuses will have to be kept in their way. The dates for the payment of Government money will have to be fixed later. The system of purchases will have to be changed. At present not only there is no inducement to keep varieties separate but there is a temptation to get varieties of lint at least mixed up.

(2) I think the present organization of the Agricultural Department in handling cotton as far as production and purity goes is good. The only suggestion to be made is the increase of establishment and selection of proper men for inducing people to go out of their old beaten track and take to new methods by showing them the defects.

II.—Commercial Aspect.

459. (30) **Local trade customs.**—I am acquainted with the local trade custom in regard to the marketing of the cotton crop in the Yeotmal cotton market only. But the same custom prevails in all the cotton

markets in Berar as far as the routine is concerned If there is any difference at all it is with regard to minor items which may well be neglected at present The cultivators of different places take their ginned

as the ca e may be or sometimes both Then the empty carts are weighed After accounting is done the cartmen leave for their respective places blaming all the while the brokers the *aratyas* and finally their own lot or *kismat*

(2) Sometimes
quite against the
taken as one of the
giving better power to the cotton market committees to enable them to handle properly middlemen buyers brokers *aratyas* and weighmen for any malpractices that may be brought to their notice For the
ould possibly
So the best
and purity
sent by the
Agricultural Department in the case of purity of cotton seed

(3) The pre ent system of ginning cotton in big ginning factories is not in any way suited for keeping the purity of seed for the production of a pure variety of cotton next year It will do well when the d r able variety of cotton is produced in large quantities and tal en to the factories in a pure state For the present the system of establishing small factories introduced by the Agricultural Department will serve the desired object in the best possible way

(4) In the case of *aratyas* they are allowed to b iy by rules but both *aratyas* and brokers receive *arat* and brokerage from the cultivators and instead of fighting for their masters from whom they receive their remuneration they serve their own interests at their (masters) cost This ought anyhow to be remedied by making necessary changes in the rules

(5) The system of advances to cultivators forward sales or contracts by them should as far as possible be discouraged They are quite ignorant of the current Bombay rates and being needy accept money on any terms which sometimes are not even understood by them

460 (31) **Standardization of commercial names**—I am acquainted with only the following commercial names of cotton —

(1) *Oomras* coming from Amraoti
(2) Akola " Akola
(3) Broach " , Broach
(4) *Kumpta* , , Dharwar side

I do not think that the names are very suitable All the varieties of cotton should be given their current names with the names of places from which they come prefixed to them

461 (32) **Buying agencies**—In the case of finding out the best form of buying agency the system of co operation resorted to at present by the Agricultural Department may in my opinion be followed

III —STATISTICAL

462 (35) **Publication of Liverpool and Bombay prices**—I think the daily publication of Liverpool and Bombay cotton prices at up country markets through the agencies of the market will be of much u e

IV —MANUFACTURE

463 (36) **Type and number of gins**—I use Platt and Dobson gins in my factory I have got only eight gins

464 (40) **Factory labour**—My factory being small I have not experienced any difficulty in obtaining factory labour

staple cotton was replaced in large quantities by long staple I hav had some experience of the ginning of *buri* cotton and I think there is no difference in ginning *buri* and *roseum*

V —GENERAL

467 (46) **Attitude of buyers to improved cottons**—I am not acquainted with any ca es of buyers in the past having been prepa
them When the Agricult
supplied the seed farm pe
busy season About three
the tracts of which I have got

for grazing for so many cattle is also a very difficult question for Government to solve Looking to the e things I think the present holdings are quite insufficient These holdings should be more extensive Besides these small holdings are liable to be divided to infinity This should be remedied if possible

N.B.—For the oral evidence of this witness see pages 78 and 79 below

Rao Sahib V. C. KULKARNI of Gaigaon.

EXAMINED AT AKOLA, NOVEMBER 16TH, 1917.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

(*a*) "*Deshi*" *short staple cotton.*

469. (1) **Experience.**—I am a resident of Gaigaon of the Akola district in Berar, my principal occupation being agriculture. I have been in touch with cotton cultivators for the last twelve years.

470. (2) **Varieties.**—In this district, cultivators do not generally grow a pure variety of cotton; a mixture of all the following varieties is grown and is commonly called '*gaorani*' or '*jari.*' (1) *Roseum*; (2) *cutchicum*; (3) *malvense*; (4) *verum*; (5) *bani* and (6) *buri*. From the last seven or eight years some cultivators are growing pure and selected seed of *roseum*, and it is found to be more profitable both in yield and lint than the mixed variety mentioned above.

471. (3) **Size of holdings.**—The area in possession of landholders in this district varies from about five to 1,500 acres but generally it may be said that the average size of holdings may be from 20 to 25 acres. Formerly when the rains were excessive, *rabi* crop could be grown successfully. Cultivators used to make three equal divisions of their holdings under (1) cotton, (2) *juar*, (3) *rabi* crops. But for the last fifteen years, the last crop is gradually discouraged and the first has taken its place. At present nearly two-thirds of their holdings are under cotton and the remaining under other crops. The reason for increase in cotton is chiefly due to gradual rise in prices and shortage of rainfall.

472. (4) **Yields and profits.**—The average yields and profits per acre from *deshi* short staple cotton can be estimated at about Rs. 35 and 20, respectively.

473. (5) **Rotations and manures.**—The general system of rotation is cotton after *juar* or rarely wheat and again cotton. But many cultivators are nowadays inclined to sow cotton successively for four to five years. Generally manure is not applied to all the area as it is not available in large quantities. Very few who can afford to give manure use only cattle dung, accumulated from their farmyards. Another system of manuring land is that of sowing leguminous crops which leaves manurial properties in the soil to thrive the cotton crop for next year.

474. (6) **Comparative returns.**—The reply to these questions is separately given in a tabulated form annexed hereto.

475. (7) **Conditions affecting increase in area.**—Fluctuation of the area under cotton chiefly depends on its rate and character of season in previous years. For instance, if the outturn of cotton owing to excessive rainfall or other unsuitable climatic conditions is found much less than that of the ordinary season, the growers are naturally inclined to reduce the area to some extent next year. I do not think there is any scope now for the increase of short staple cotton as there is no room for the reduction in the area under other crops. It has reached the maximum. It can neither be decreased unless long staple cotton or other crops pay at least an equal return to the growers.

476. (8) **Uses of seed and seed selection.**—Cotton seed is generally used for feeding both working and milch cattle. The rest is exported to foreign countries. A small quantity is also used for extracting oil. No seed selection is made for *jari* cotton. Cotton buyers sort out from the lot such carts of *kapas* which they judge to be better and gin it separately and sell the seed for seed purposes. Those who grow pure variety of *roseum* get their seed supply from seed farms or unions which have been started to help to extend the cultivation of this variety and are supplied with selected seed from the Government farm, Akola, every year.

477. (9) **General economic conditions.**—The general state of cultivators is not very satisfactory. They being illiterate are in the habit of being extravagant and thus are often over-run with debts carrying exorbitant rates of interest. The result is in spite of all his efforts to produce a good crop with improved methods the cultivator finds himself in much difficulty to repay even the interest from his net profits leaving the principal debt as it is. He has again to approach the *sahukars* and ask them for fresh loans required for next year's cultivation. At this time the cultivators being already under debt are required to submit to the conditions imposed by the money lender as they have no other source of meeting their requirements. At times the *sahukar* enter into a contract and purchases all his future produce in advance at a fixed rate. Sometimes the cultivator is obliged to sell his produce even at a fallen rate under the pressure of *sahukars* to repay his debts. Being short of money from the beginning, he cannot wait up to ginning to get the full advantage of lint and seed of his cotton. Being in touch with the district work of the co-operative credit societies and agricultural unions for the last seven years, I have come to the conclusion that the credit societies are no doubt very useful to help the cultivators to a considerable extent. But unless all sorts of the dealings with local *sahukars* are stopped and their evil influence eliminated, credit facilities alone will not do as much good as is expected of them. The *sahukars* are sure to recoup their loss by monopolising the purchase of produce and supplying other requirements. It is needless to say how the cultivators are further deceived in weighments and other matters when they have to deal in selling their produce. It is not that the cultivator does not know all these hardships but he is incapable of preventing them. To avoid this trouble of sale, it is necessary in my opinion that a check society be organised, at each market place to safeguard the interests of the cultivator. The duties of the society should be to see that the right quality gets the right value with proper weighments. These societies should also undertake to serve as middlemen on a small amount of commission to sell the cotton or lint or any other crops, namely, *juar*, wheat, gram, etc., of those who would like to sell it through the society.

(2) The Central Bank should undertake to organise and control such societies and to finance them when necessary. It is true that in the beginning, the existence of such a society may not be liked by the present middlemen, who may create numerous obstacles to hamper the society's work and do their best to see that the movement is a failure. But where the members of this society have themselves got some business knowledge, these troubles would in course of time surely disappear, as a result of the tact and patience exercised by them.

(3) In order to give the maximum profits from ginning to the cultivator, it is also necessary to have small ginning plants run by oil engines established at principal centres in every *taluk* within their easy

reach At present, petty cultivators (whose number is not inconsiderable) owning a cartload or two of *kapas* do not get access to the factories and are in one way obliged to sell their cotton unginned and thus lose a portion of the return of their honest labour

(*b*) "*Deshi*" *long staple cotton*

staple variety

(*c*) *Exotic cotton*

479 (21) **Varieties** —I tried the American variety of cotton named *buri* in the year 1910 11 but *to my disappointment it proved to be a failure I found that it suffers from red disease at the end of the* rains and its growth is stunted I do not think it would be of any advantage to import the seed of these cottons every year as it must be accustomed to our climate and nature of the rainy season Efforts to introduce *deshi* or exotic long staple cotton cannot in my opinion be successful unless they prove to be equally good in paying the return though not better in yield than the indigenous short staple varieties It is but natural for any cultivator to expect the maximum return for his minimum labour

N B —For the oral evidence of this witness see pages 78 and 79 below

Central Provinces.]

Rao Sahib V. C. Kulkarni.

[Continued.

ANNEXURE.

COMPARATIVE RETURNS OF DIFFERENT VARIETIES OF COTTON.

(Vide paragraph 474 above.)

Name of variety.	Outturn per acre.	Lint per cent.	Quantity of lint.	Quantity of seed.	Value of lint per 280 lbs.	Value of seed (bazaar).	TOTAL	Cost of cultivation.	Net profit.	Higher price obtained by sale of seed for sowing.	Net profit per acre taking higher value of seed into consideration.	Value of *kapas* if sold as *kapas*.	Net profit per acre if *kapas* is sold.
	lbs.		lbs.	lbs.	Rs.	Rs. A. P.	Rs. A. P.	Rs.	Rs. A. P.	Rs. A. P.	Rs.	Rs.	Rs.
Deshi short staple cotton.													
Jari	230	34	78	152	31	3 12 0	34 12 0	15	19 12 0	5 0 0	21	33	18
Roseum	260	39	101	159	40	4 0 0	44 0 0	15	29 0 0	10 0 0	35	38	23
Deshi long staple cotton.													
Bani	180	25	45	135	22 8 0	4 0 0	26 8 0	15	11 8 0	..	..	25	10
Exotic cotton.													
Buri	50	34	17	33	8 8 0	1 0 0	9 8 0	15	5 8 0 (Loss).	..	..	..	..

Mr. B. M. PANDIT, of Murtizapur, Akola District.

Examined at Akola, November 16th, 1917.

Written statement

I—Agricultural Experience

(a) "Deshi" short staple cotton

480 (1) Experience—I am stationed in the Akola District of the Central Provinces I am a permanent resident of Murtizapur, a *taluk* town in Akola District I have got cultivation of my own and am also in [illegible] this district

[illegible] of the following types of [illegible] rani

But the general system [illegible] successively.

485 (6) Comparative returns—The comparison of the returns of the different varieties of *deshi* short stapled cotton with (a) *deshi* long stapled cotton, (b) other *deshi* crops, (c) exotic cotton, is shown in the [illegible] appended

[illegible] there are *til*, *mung*, *tur*, etc, among other *deshi* crops [illegible] figures are not available

[illegible] short stapled cotton sometimes fluc[illegible] on the break of monsoons [illegible] stapled varieties as it has [illegible] finds that he gets at least

[illegible] ions specially [illegible] produced on [illegible] and central [illegible] and seed pro[illegible] duced by hand [illegible] quantity of lint [illegible] produced, the

[illegible] ebts owing to

(b) "Deshi" long stapled cotton

[illegible] types are grown in this district though *malvense* and [illegible] ted above In the past, about twenty [illegible] but owing to lower return of both *kapas* [illegible] as much money return as he gets from [illegible] Besides, experience for the past ten [illegible] successively uncertain, which is very

(c) Exotic cotton.

[illegible] cotton showed that this type did not

II.—Commercial aspect.

491. *Suggestions for improvement of system of handling cotton.*—In my opinion, the present system of handling cotton is defective. In the first place, much more care should be taken in picking which would prevent the dirty appearance. Then the general class of cultivators being ignorant is much more deceived when the crop is brought to the market. The cultivator has no direct approach to the buyer without the medium of brokers and *aratyas* who do not take as much precaution as is necessary to safeguard the interest of the seller. Again according to the present arrangement of the ginning factories, a small cultivator cannot get advantage of ginning which can be removed, in my opinion, by scattering small ginning plants within their easy reach or by dividing large factories into small compartments of *four to six gins*: this will help considerably to grow pure types of varieties also. No proper attention is at present given by factory owners to cotton seed, the flooring beneath the gins is neither paved nor cemented and the consequence is that the seed which falls down is mixed with soil and dirt. Not being a mechanical man I cannot say definitely, but I think that the fitting of the gin should be such as may not allow the seed to remain in them while dropping. The establishment of seed farms will no doubt do much good in supplying pure and selected seed to cultivators, under the supervision of the expert staff on a larger scale who would also assist the cultivator in marketing their produce. According to the present demand, I think that at least one man should be posted to each taluk or a market place, to safeguard the interest of the cultivators. I do not think that any more improvement is necessary in the regulation of buying agencies and ginning factories except imposing some restrictions upon the brokers and *aratyas*, if they are at all considered to be necessary, with regard to paying more attention to the interest of the seller.

492. **(30) Local trade customs.**—With regard to the marketing of the cotton crop the cultivator takes his *kapas* to the nearest market in cart load where the broker or *aratya* settles the rate with the buyers in consultation with the seller and in this way the *kapas* is sold. At times the buyer advances money to the cultivator at the time of interculture of his crop on a promise that the *kapas* will be sold to him only, or by entering into a contract of a fixed rate.

493. **(31) Standardization of commercial names.**—At present the *kapas* is distinguished into two principal divisions named after the tract from which it comes, *viz.*, *deshpatti* (a tract of superior black soil), *khadas patti* (a tract of inferior soil). It is further distinguished as under (1) *lal patti* (not damaged by rains) (2) *kali patti* (spoiled by rains) (3) *tardar* (long stapled whether it may be pure or mixed, (4) *jada-mal* (rough short stapled containing more lint) (5) *zola* (last pickings of all sorts). So far as our tract is concerned, these names seem to be suitable.

494. **(32) Buying agencies.**—I do not think that the present form of buying agency requires any change.

N.B.—For the oral evidence of this witness see pages 77 and 78 below.

ANNEXURE

COMPARATIVE RETURNS OF COTTON AND OTHER CROPS.

(*Vide paragraph 485 above*)

Deshi short stapled cotton					*Deshi* long stapled cotton		Other *deshi* crops			Exotic cotton		
Name of variety.	Approximate yield per acre in lbs	Value of *kapas*	Value of lint when ginned	Value of seed when sold for seed purposes	Name of variety	Approximate yield per acre and its value	Name of *crop*	Approximate yield per acre in quantity of grain and *fodder*	Value	Name of variety	Approximate yield per acre	Remarks.
	Rs	Rs	Rs						Rs			
Jari	250	30	28	6	*Bani*	I have never grown or seen this type of *cotton* but I have heard in past from some old cultivators that the yield of it was much less than *jari* and its lint percentage was 26 or 27	*Juar*	640 lbs of grain	18	*Buri*	I had grown this variety only for one year i e, in 1911 1912 when I found that the leaves were affected with red blight and the crop was totally damaged in the winter, hence no figures are available	
Roseum	280	35	37	12			Wheat	500 lbs of grain	27			
				If the seed is sold for feeding purposes it will bring only Rs. 4 8 in both the varieties			Gram	200 lbs of grain	10			
							Groundnut	500 lbs of nuts only	31			
								Besides the above quantity of *grain* all these crops supply *fodder* which is never *weighed* nor measured, hence *no figures* are available				

Conference of representatives of Seed Unions in Berar.

At a conference of representatives of Seed Unions in Berar held at *Akola* on the 16th November 1917, the following were present:—

Rao Sahib B. RAMCHANDRA LANDGE, Izaradar, Sonvadhona, Yeotmal; Rao Sahib V. C. KULKARNI of Gaigaon; Mr. B. M. PANDIT of Murtizapur, Amraoti; Mr. HIR LAL of Kokarda, Darijapur, Amraoti; Maulvi GHULAM AHMAD of Pimpalgaon Raja, Amraoti.

Mr. Landge gave the following evidence on his own behalf and that of the other representatives of the Seed Unions.

495. (*Mr. Roberts.*) The Central Farm of a Seed Union belongs to one member only. The area of the Central Farm with which I am connected is 100 acres, all under cotton. There are more than 35 branch farms in my Union. Each branch farm has about twenty acres. Some are as big as thirty acres. As the cotton is picked, the *kapas* is kept by the member himself at his own place until it is brought to the ginning factory, which belongs to one member, who in the case of my Seed Union is myself. Near the ginning factory is a storehouse in which cotton seed is kept. The members of a Seed Union may be classified in three classes:—

(1) Those who prefer to gin their own cotton, take away the lint and keep the seed at the Union storehouse.
(2) Those who sell the *kapas* but keep the seed for themselves buying it back at the market rate. Their *kapas* is ginned at the Union ginnery.
(3) Those who sell both their cotton and cotton seed to any one willing to buy it.

The members of the Union, who have branch farms, are allowed to sell their seed to people outside the Union. The Central Farm seed and the Branch Farm seed are kept separate. The Central Farm seed is distributed among the members of the Union first at the rates dictated by the Agricultural Department. We mostly take these rates. The rate last year was about Rs. 35 per *khandi* of 560 lbs. The year before last it was Rs. 28. Last year for the best seed the rate was Rs. 40 and for the second quality of seed the rate was Rs. 35 per *khandi* of 560 lbs. of seed. The price of seed in the bazaar varied from Rs. 14 to Rs. 20 per *khandi*. Last year at the end of the season it was Rs. 16. You may, therefore, say that we are charging 2½ times the price of the seed in the bazaar. We charge at the same price as that at which we get our own seed. The branch farms get the central farm seed at that rate only. The branch farms get the same rate for their own seed as they pay themselves. The seed from these branch farms goes to the cultivators outside the Union. There is no difficulty in disposing of it. There is always a great demand for seed, at least for the seed of my Union. People come to my place and take away the seed. Some portion of the seed is sold through the Tahsildars. About half of my seed is distributed through the reve[illegible] Before selling we convene a meeting of the Taluk Association at which the Deputy Director [illegible] of the Farm is present and the whole arrangement is made with the Tahsildar. Everything is settled and we send our seed accordingly. We send about half of our seed and the rest we sell at our own place where people come for it. The branch farm seed is sold to cultivators outside the Union, and we lose the seed of it altogether. The branch farms get fresh seed from the central farm seed store and the central farms get restocked from Akola. The central farm supervises the branch farms carefully. Last year we could not get any fresh seed from Akola and had to use our own seed. That was on account of the failure of the crop. Even if we buy seed from outside, we do not allow it to be mixed with our seed. Branch farms uproot other varieties than those grown from our seed but outsiders do not do so. The Unions employ a man to do this roguing to take away the impurities. He is called a *kamdar*. He is a servant of the Union. In my Union, he gets a pay of Rs. 12 per mensem. He works all the year round on cotton. When the cotton is being brought to the ginning factory, he supervises the ginning; he does not allow any mixture to be made. Whenever he notices mixed cotton being ginned, he has to stop the ginning, get the gin cleaned out to his satisfaction before any more cotton is ginned. In the rains he has to look after the farms to find out whether there is any yellow flowered cotton. From February to June, he helps in the distribution or sale of seed. March is the only month when his work is a little slack. We keep the ordinary registers, such as list of members, cash books and ledgers, books, showing the amount of cotton bought in, payments due, etc. We are required to send returns to the Agricultural Department. The Agricultural Assistant comes and inspects. The Union has no capital. There is no necessity for it. We take subscriptions from the members to meet the pay of the *kamdar* or to defray any other expenses. There is no need of capital. The ginning factory is mine. The Union does not actually buy any seed or cotton. It simply holds them for the members. I charge simply a ginning rate, of two annas less per *bhoja* of 10 maunds of ginned cotton, *i.e.*, 280 lbs. than the ordinary rate. When the ordinary rate is Rs. 4-12, I charge Rs. 4-10, not only to the members of the Union but to everyone. My factory is out of the way, so it is necessary for me to make some concession. The rate at Yeotmal this year has been enhanced beyond Rs. 4-12. I have not enhanced my rate but may do so.

496. When people sell their pure *roseum kapas*, the extra price that they get depends on the quality. If it is from a good field, they get sometimes three or four rupees more per *khandi* of 560 lbs. If the quality is not good or the percentage of lint is less, the price is less. The maximum premium for *roseum* is something like Rs. 3 to 4 per *khandi* of 560 lbs. If the cotton has to be taken to Yeotmal, that costs Rs. 2 more. The average extra price for *roseum* over *jari* therefore is Rs. 2 per *khandi*. I do not deal in lint at my place. The lint is taken to Yeotmal and sometimes to Amraoti. Even if the same price is obtained for *roseum* and *jari*, the buyer loses something on *jari* for he gets a higher percentage of lint in *roseum*. I gin the cotton and after that I have no further de[illegible] with the cotton i[illegible]. The actual owner of the cotton sells the lint independently.

497. (*Mr. Henderson.*) If I could get a higher price, I [illegible] gladly grow bu[illegible] As to the extra price that we should need to be able to grow it, I c[illegible] ut it wo[illegible] e outturn that it gave. If we got the same crop as *roseum* and if we [illegible] ne[illegible] for the loss by *roseum* of the lower percentage of lint, we should [illegible] cannot say anything about others. If we got Rs. 3 as premium fo[illegible] would be sufficient. I am not sure about the outturn [illegible] about Rs. 8 to Rs. 10. I cannot say definitely whether,

whether I should be inclined to grow *buri* on good land, I should say that anything that is an advance
is ... t see any disadvantage connected with
bur ... It would be in a way better to grow
it l ... If Mr Clouston recommended it, we
... d it but it was found that *roseum* was

... attacked both *roseum* and *bani* but not *buri* *Buri*,

Mr. D. CLOUSTON, M.A., B.Sc., Officiating Director of Agriculture, Central Provinces.

Examined at Akola on November 17th, 1917 and at Khamgaon on November 18th, 1917

Written statement

I.—Agricultural Experience

(a) "Deshi" short staple cotton.

499 (1) Experience.—I have been stationed for twelve years in the cotton tract of the Central Provinces and I have been in actual touch with cotton cultivators for all that time

500 (2) Varieties —I have supplied in a separate note the information asked for regarding the varieties of cotton grown, their outturns and the proportion of the cultivated area under cotton in our chief cotton growing districts *

... 26 unregistered Co operative Seed Unions by

... —To prevent the mixing of improved cotton ... other crop Cattle

(c) Exotic cotton

507 *Experiments with exotics*—Every known variety of long and medium stapled cotton grown in India has been tried by the department American and Egyptian cottons have also been tested. but not one of

*Not printed *Vide* Mr Clouston's article on "The Improvement of Cotton Cultivation in the Central Provinces, studied from an economic point of view " in the Agricultural Journal of India, Special Indian Science Congress, Number 1917

similar in physical texture to *bhata*; such soils produce fairly good crops of long-staple cotton despite the high rainfall of these rice districts. But in these three districts, the demand for labour during July and August is very great owing to the fact that most of the rice is transplanted: the weeding of cotton has to be done about the same time and clashes with the transplantation of the staple crop rice. This in itself will probably prevent any great extension of the cotton area in this part of the rice tract. In Chhattisgarh, on the other hand, the large rice area is nearly all sown broadcast and a minimum amount of labour is expended on the cultivation of the crop. *Bhata* soil, moreover, produces very few weeds, and the weeding of cotton requires but little cultivation. There are large areas of land lying waste in this tract, more especially in the Chhattisgarh division on which long-staple cotton can, I believe, be grown with irrigation.

III.—STATISTICAL.

510. (33) **Improvement of cotton forecast.**—I consider that the cotton forecast at present published for the Central Provinces is sufficiently accurate.

511. (35) **Publication of Liverpool and Bombay prices.**—During the cotton season there is a keen competition among buying agents at all the cotton markets. These agents have daily telegraphic intimations sent them from Bombay and the market prices paid here are nearly always in keeping with Bombay prices. Cultivators living far from any cotton market sometimes sell their cotton to middlemen in their villages and do not therefore get a fair price from it. To remedy this, the opening of more cotton markets would appear to be necessary.

V.—GENERAL.

512. *General.*—When *bani* (Hinganghat) cotton was grown, the buyers paid less for *bani kapas* than for the *kapas* of the much coarser and shorter-stapled *latirilayati* or *jari* cotton because of the low ginning outturn which *bani* gave. The grower of this fine quality cotton was hit in two ways. He got a relatively low average yield of *kapas* as well as a relatively low price per *khandi* of that *kapas*. The cultivation of *buri* cotton was at one time pushed by the department: the area rose to about four thousand acres and the Department of Agriculture arranged for the sale of the lint to the Manager of the Empress Mills who paid an enhanced price for it. *Buri* however failed to justify its introduction. Our growing season proved too short for it and in years of short rainfall it suffered badly from red leaf blight. The bolls were ripened prematurely by the dry weather and hot sun of October: the vegetative growth of the whole plant was also checked and the outturn and quality of the lint suffered. Buyers invariably classed it as "weak."

VI.—IRRIGATION.

513. *Experiments with cotton under irrigation.*—Experimental work with irrigated cotton in the Central Provinces has only lately been started. Cotton grown on lateritic soils requires from five to six waterings of about two inches each to produce a maximum crop. Irrigation is seldom needed before the end of October and it does not pay to continue to irrigate the crop after the middle of March. The irrigated crops that will compete with cotton on these soils are groundnut, sugarcane and rice. Irrigation will have to be done from existing tanks. Some of these will be fed by the canals already constructed or under construction. There are no wells in the tracts where irrigated cotton could be grown.

514. (71) **Cropping and causes affecting it.**—In the rice tract an average holding of 100 acres would be cropped as follows:—

50 acres, approximately, would be under rice.
20 acres, approximately, would be under other *kharif* crops such as *kodo, tur, til, etc.*
30 acres, approximately, would be under *rabi* crops such as wheat, gram, linseed, etc.

The cultivation of cotton on light lands in this tract would mainly affect the cultivation of *kodo*; but it is not in the interests either of Government or the cultivator to grow on irrigated land a crop like *kodo*, the gross value of which is only about Rs. 12 an acre. On these lands, cotton could be grown in rotation with groundnut, sugarcane and green fodders, thus:—

1st year.	2nd year.	3rd year.	4th year.
Cotton	Cotton	Groundnut	Irrigated fodder
	or		
Cotton	Cotton	Groundnut	Cane

This system of cropping light soils of which there are large areas lying waste in the rice tracts at present would largely revolutionize economic conditions.

History of attempts to introduce long staple cotton in the Central Provinces

515. *Historical.*—The history of the different attempts to introduce the cultivation of long-stapled cotton may be arranged in chronological order as shown below:—

1866.—"A Superintendent of Cotton Affairs" was appointed for Wardha District. Mr. Rivett-Carnac became Cotton Commissioner and held the appointment till 1871 when he was appointed Commissioner of Cotton and Commerce to the Government of India.

The primary object of the Cotton Commissioner's appointment was the introduction of foreign long-stapled cottons and the improvement of the indigenous plant. Experiments were started with "New Orleans" and other American cottons which were being tried in Dharwar by Dr. Forbes, Cotton Commissioner of Bombay. Despite the fact that the Cotton Commissioner gave the new cotton under trial in the Central Provinces every attention, the outturns were small and the staple much weaker than that of indigenous cotton. Egyptian varieties proved equally unsuitable for the climatic conditions of the Central Provinces.

Having satisfied himself that none of the exotic varieties under trial were ever likely to do well, Mr. Rivett-Carnac determined to fall back on *bani* (Hinganghat) cotton, one of the indigenous varieties widely grown at that time. *Bani* was equal in quality to "middling American." Seed and Experimental Farms for the propagation of this variety were opened under the supervision of gardeners from home and large quantities of *bani* seed were distributed.

1869-70.—The area of these *bani* Seed Farms was largely increased.

1870-71.—These same Farms were developed into general Experimental Stations.

The results of these experiments may be briefly summarised as follows:—The exotic cottons even when cultivated with great care and expense had given small yields; they never escaped partial damage from the effect of the season. The attempt to extend the cultivation of the indigenous variety *bani* failed to produce any lasting effect

of cotton within the last eleven years.

518. Comparative returns.—*In one of these articles on The improvement of cotton cultivation in the Central Provinces from an economic point of view*, I have given the average outturns of cottons under trial for nine years on the Akola Farm. For ready reference that statement is given below:—

Variety	Percentage of lint.	Average outturn lint per acre in lbs	Value of lint at present prices
			Rs
Roseum	40	214	93
Cutchicum	38	201	87
Verum	32	147	64
Malvense	32	138	66
Buri	33—34	128	67
Bani	25—26	103	54
Jari from Berar	34	158	69
Saugor Jari from Central Provinces	32	147	64

We may take it that in normal years the ryot gets about ⅗ths of these yields and that *roseum bani*, *buri* and *jari* would give him the following yields of lint per acre:—

	Lbs
Roseum	128·4
Bani	61·8
Buri	76·8
Berar Jari	94·8
Central Provinces Jari	88·2

this case. Given porous well aerated soil, a heavy rainfall between the middle of June and end of September does not detrimentally affect the growth of the cotton plant.

Annexure I.

The organization of district agricultural work.

It was at first thought that it would be possible to appoint Inspectors of Agricultural Unions who would work under the supervision of the Department of Agriculture, but who would be under the administrative control of the co-operative central banks. This has been tried but does not promise to work well, for the reason that the Directors of central banks are, as a rule, not directly interested in agricultural improvements. They are busy men who devote part of what little spare time they have to the interests of these banks. To push agricultural improvements they have neither the time nor the inclination. The department is therefore trying to fit Taluk Agricultural Associations for the work of controlling Agricultural Unions. The Taluk Associations will sooner or later consist entirely of representatives of these unions. All our work will be linked up—the unions into one central Taluk Association with the Tahsildar as president, and the Taluk Associations into one central District Association of which the Deputy Commissioner is President. We have even gone a step further by appointing a Circle or Divisional Committee consisting of selected members of the different District Associations. This committee meets at the time of the Divisional Show and Conference under the presidentship of the Commissioner and decides on the new lines of agricultural work to be taken up in the division.

2. But we want to go a step further. Taluk Associations require paid workers, and should therefore be supplied with the necessary funds. Questions of this kind are discussed by our Circle Committee. It was decided by the Berar Circle Committee, last year, for instance, that District Boards in that division should be asked to give a grant to the Taluk Associations. They have since done so in some districts; Buldana District Board, for example, allotted Rs. 1,200 last year for its five Taluk Associations, or Rs. 240 per association. *Kamdars* on Rs. 20 are being appointed to look after the interests of these Taluk Associations. They are paid from this allotment of Rs. 240. Each association also raises money by asking its members to pay an annual subscription. This money is being used in some cases for the purchase of iron ploughs which the association gives out on hire for prizes for agricultural shows, for the printing of leaflets regarding the supply of *roseum* seed available, etc. One Taluk Association has put up proposals to the effect that a second *kamdar* should be appointed so as to allow the man already employed more time for touring. The second *kamdar* they propose to put in charge of a shop to be started for the sale of improved seeds and agricultural implements.

3. A few of our Taluk Agricultural Associations in short are deeply interested in the work of developing agriculture and are now coming forward to initiate new ways of extending agricultural improvements. I hope that, at no distant date, it will be possible for the more promising associations to have their own trained agricultural assistants who, working under the supervision of the Department, will help to organize and to supervise all the different lines of work which the Department has in hand in the districts. Our aim as a Government Department will in future as in the past be to win the confidence of the actual cultivators and to be their guide, philosopher, and friend.

4. Our work has increased by leaps and bounds within the last twelve years. We cannot now afford time to deal with each cultivator as an isolated individual and have therefore fallen back on the device of grouping them into Co-operative Unions, Co-operative Societies, Taluk Associations, etc., all working together towards a common end, namely, the economic development of agriculture.

D. CLOUSTON.

Annexure II.

Demonstration report of the Western Circle for the year 1916-17.

This report deals with the work done by the Department in the cotton tract of the Central Provinces, which includes all four districts of Berar, the districts of Nimar and Wardha, and part of Nagpur, Chhindwara and Chanda. There are seven District Agricultural Assistants in charge of the work. The district staff is very inadequate, but it is not possible to recruit trained men for the Department faster than we are doing at present. To assist these Assistants, seventeen kamdars have been sanctioned.

The programme of demonstration work to be carried out by Taluk Agricultural Associations during the year was considered by a Circle Committee which met at the time of the Agricultural Conference held on the Akola Farm in December 1916. Over this committee the Commissioner of Berar presided; several district officers and leading landholders were also present.

Much attention has been given during the year to the Taluk Associations of which there are now 32 in the circle with a membership of 1,560. Every *tahsil*, except the Melghat in Amraoti district, has an association of its own with the tahsildar as Chairman and a non-official member as Secretary. Most of these Taluk Associations are doing good work under the guidance of the Department in carrying out agricultural improvements in their respective *taluks*. The members are the most enterprising landholders of the *taluk*: they are the men who propagate our selected *roseum* cotton seed, push the sale of improved implements and demonstrate whatever agricultural improvements the department desires to introduce. The members pay a subscription of from Re. 1 to Rs. 2 each per annum. With these small contributions, they hope to build up a fund which will be utilized in furthering agricultural improvements. Some of the associations have already purchased improved ploughs for the use of their members as well as for demonstration purposes. The Khamgaon Association purchased seven Turnwrest ploughs last year at Rs. 44 each. These they hired out at the rate of two annas per day, and in four months made Rs. 102-10. The Akot Taluk Association purchased two ploughs and one winnower for the same purpose. The members of the Khamgaon Association have appointed a *kamdar* to look after their implement depôt and to do a certain amount of demonstration work. A sum of Rs. 1,200 has been given by the district board, Buldana, to the Taluk Associations in that district to enable them to purchase implements for hire, and to carry out such other improvements as the Department of Agriculture may recommend from time to time.

The programme of work drawn up for these Taluk Associations and approved by the Circle Committee included—

(1) the opening of a large number of new *roseum* seed farms

(2) the sale of copper sulphate for steeping *juar* seed to prevent smut,

(7) the holding of agricultural shows

In the year under report ten new unions have already been registered and two applications are pending

in the circle

Name of source.	Quantity in lb
Registered unions	346 594
Groups of seed farms (unregistered unions)	625 068
Individual seed farms	665 346
Total	1 637 008

In addition to this 1 883 905 lb of *roseum* seed were distributed by the cotton growers, factory owners

implements recommended by the Department at work in the fields At the Conference held in connection with the Show, the following medals and *sanads* were presented to landowners who have played a leading part in popularising agricultural improvements in their districts —

Gold medal

1 Rao Bahadur K J Deshmukh of Khamgaon

Sanads

1 Mr M R Dokras of Chandur district Amraoti
2 „ Motiram Parashram Patel of Navasari district Amraoti.
3 „ S R Ambikar of Saoli district Nimar
4 „
5
6 „
7 „
8 „
9 „
10 „

D CLOUSTON

Mr D Clouston called and examined

518 (*Mr Henderson*) The main aim of the Agricultural Department in the Central Provinces is to benefit the cultivator I would not recommend him to grow any cotton that would not pay him well *Roseum* pays him better than any other variety that he has ever tried If it were possible to get a long staple cotton that would pay him better we would have no trouble in substituting it for *roseum*. The difficulty which we have experienced in introducing *buri*—a long stapled exotic variety is that, as a crop, it cannot be depended upon to the same extent as *roseum* It suffers much from drought in years of short

ture has done much within the last ten years to extend the cultivation of *roseum* which is one of the ... commonly known as *jari* In introducing *roseum*, ... substitution of a high yielding ... profit than *jari* or any of the

cotton at its true market value It is true that the gin-owner would rather buy on ginning percentage than on quantity of staple but that feeling would cease to exist as soon as it was found more profitable to buy the long stapled variety

520. In my opinion, the present tendency of prices in favour of long-stapled cotton will continue only so long as the war lasts. When the war ends, America will again increase her output of raw cotton, and the demand for long stapled cotton grown in India will decrease. The price is dependent on economic laws over which the cultivator has no control. In the production of long-stapled cotton, America has been able to undersell us in the past, and will, I believe, continue to do so. The construction of new mills in America involves an increasing demand for the American crop no doubt, but America is making great strides in the development of her agriculture, and can, I believe, increase her outturn very considerably by popularising improved methods of cultivation. As to what the result would be if America were to impose a heavy export duty on cotton, I should like to say that too much stress should not, in my opinion, be attached to calculations drawn from hypotheses of that kind. There will be a demand for long stapled cotton in India after the war no doubt, just as there was a demand for it before the war began but that demand will not be so great as to enable the purchaser to pay a premium sufficient to induce the cultivator to grow it in the cotton belt of the Central Provinces and other cotton tracts where short-stapled but much hardier and more prolific cottons are being grown at present. There are tracts in India where, owing to the humidity of the climate or to the facilities offered for irrigation, long stapled cotton, even at present prices, is more profitable than short-stapled and short season cottons grown in less favoured tracts.

521. From the experience gained by us in the Central Provinces, it would appear that it would not pay to grow long-stapled cottons such as *buri* and *bani* nor *jari* cotton of mixed staple in preference to *roseum*, unless a premium of about 70 per cent. for *buri*, 106 per cent. for *bani* and 31 per cent. for *jari* were paid. If given that premium for the lint of *buri*, it would be possible to grow a few thousand acres of this variety on the best deep black soils of the cotton tract. Our experiments in which we compared the relative yields of *buri* and *roseum* were carried out on land that was not infected with wilt. In wilt infected areas the outturn of *buri* is much more nearly equal to that of *roseum*, and for that reason we have for years been recommending its cultivation in such areas. In the rice tract which includes all Chhattisgarh Division, Balaghat, Bhandara, Chanda, and part of Nagpur, there are large areas of soil derived from laterite and crystalline formations which, being very porous, are quite suited for cotton cultivation, despite the fact that the rainfall of this tract is much above the average rainfall of the cotton tract. On this class of soil an outturn of 770 lbs. of *kapas* per acre was obtained from a field of *roseum* grown on the Sindewahi Farm in 1913-14. On the Chandkhuri Farm, where we have been growing Cambodia for the last four years on a lateritic soil locally known as *bhata*, in three years out of four the yield of cotton was good. It suffered in the fourth year from an attack of caterpillars. We are now trying this same long-stapled cotton, viz., Cambodia, in other parts of Chhattisgarh on soils considered to be below the margin for cultivation. About 1,000 acres of Cambodia are to be grown by cultivators in Chhattisgarh on these poor soils this year 1918-19. We hope that the area will go on doubling every year as long as the price remains high. But even at pre-war prices, it would pay handsomely to grow cotton on this land which up to the present has nearly all lain fallow. The area will increase faster, if prices remain at the present level. There will be a steady increase, but it will not be a startling one. The cultivators of this rice tract are most backward and unenterprising, and cotton is to them an entirely new crop. We hope, however, that in the course of five or six years, it will be possible to work up to an area of ten or twelve thousand acres in this tract.

522. It is true that in the ordinary *jari* mixture there is sometimes twenty per cent. of American cotton. This exotic variety was introduced in the sixties when an attempt was made to grow it pure, but cultivators have long since ceased to take an interest in this long stapled variety. It has been grown pure by the Department on Government Farms, and our experience has been that the lint is so very weak that it does not fetch more than good *jari*. This and other varieties were introduced in the sixties by the Cotton Department of which the head was Mr. Rivett-Carnac who was designated "Cotton Commissioner for the Central Provinces." On the abolition of the Cotton Department about 1873, cultivators ceased to take any further interest in exotic cottons. Upland Georgian had been grown on a considerable scale, however, and its seed had got irretrievably mixed with that of the indigenous cotton. No system of seed selection is practised by cotton growers in these provinces, and the result is that, when a cotton of this kind once gets introduced, there is little chance of its being got rid of again.

523. In East and West Khandesh, the cotton grown is almost exactly similar to that which is found in the Central Provinces. When I made a classification of the cottons of the provinces eight or nine years ago, I found that the percentage of Upland Georgian in the *jari* mixture varied considerably in different parts of the provinces. It is higher in Berar than in the north of the provinces. From Akola I got a sample containing 49 per cent. of Upland Georgian. This I attribute to the fact that in Berar there are now considerable areas of land which are badly infected with wilt disease, and that there is a practice in vogue by which cultivators keep the seed of cotton grown on these areas. Upland Georgian like *buri* is immune to wilt, and the result is that by growing *jari* cotton on lands so affected, the percentage of Upland Georgian in it tends to increase by leaps and bounds. Some cultivators who have given up the cultivation of *buri* as a pure crop, still make a point of sowing it as a mixture with *roseum* in their fields affected with wilt. In years in which wilt does not do much damage, *roseum* is a good crop. When it is badly affected by the disease, the *buri* survives. I am not sure how much of the whole cotton area in the provinces is infected with wilt, but I am of the opinion that it does not exceed one or two per cent. *Buri* is a better cotton than Upland Georgian, as it gives a higher yield of *kapas* and a slightly higher ginning percentage.

524. *Roseum* cotton is now well-known all over the Provinces as a heavy yielder, and cultivators are prepared to pay a high price in order to get pure seed. *Bani* is not now grown as a pure crop in any part of the provinces, but it is found as a mixture in *jari* in the southern portion of Berar which is far from the railway and where, owing to the difficulty of getting pure seed, it has not yet been found possible to grow *roseum*. Pure *bani* is still grown in parts of the Nizam's Dominions, I believe. It still survives in tracts which are backward agriculturally just as *kodo*, one of the inferior millets, is grown on a large scale on good land in the more backward parts of Chhattisgarh. At present prices *bani* in the Nizam's Dominions is certainly much less profitable than *roseum* would be if grown there. In a notice compiled by Mr. Schofield of the Revenue and Agriculture Department, about 1866 when *bani* was grown absolutely pure, the normal yield of clean cotton is shown as being 34 lbs. per acre only. In my opinion *bani* is likely to disappear in a few years in the Nizam's Dominions from all tracts where the climate resembles that of the Central Provinces.

525. I do not think that the danger of *roseum* spreading in tracts which at present grow long-stapled cottons is one to be guarded against. Cultivators will not grow it unless they find that it pays them better than other varieties. I do not think that the price at present paid for *roseum* is an artificial one. It is

apled cottons and to advise
rtment to take the lead and
partments of Agriculture in
years and to check the
Some merchants brought
ear, with a view to having
to prevent the seed of this

bani The mistake was made of encouraging the cultivation of a variety which did not pay for no better

527 We have been experimenting with different crops grown in rotation with cotton in order to

disease

seed however is expensive as it has to be imp
sixty lbs per acre As a fodder for the Telinkheri Dairy Farm,
irrigation facilities Other leguminous
velvet beans shaftal, *guar* (*Cyamopsis*

anda by a corporation buying land I

520. In my opinion, the present tendency of prices in favour of long-stapled cotton will continue only so long as the war lasts. When the war ends, America will again increase her output of raw cotton, and the demand for long stapled cotton grown in India will decrease. The price is dependent on economic laws over which the cultivator has no control. In the production of long-stapled cotton, America has been able to undersell us in the past, and will, I believe, continue to do so. The construction of new mills in America involves an increasing demand for the American crop no doubt, but America is making great strides in the development of her agriculture, and can, I believe, increase her outturn very considerably by popularising improved methods of cultivation. As to what the result would be if America were to impose a heavy export duty on cotton, I should like to say that too much stress should not, in my opinion, be attached to calculations drawn from hypotheses of that kind. There will be a demand for long stapled cotton in India after the war no doubt, just as there was a demand for it before the war began but that demand will not be so great as to enable the purchaser to pay a premium sufficient to induce the cultivator to grow it in the cotton belt of the Central Provinces and other cotton tracts where short stapled but much hardier and more prolific cottons are being grown at present. There are tracts in India where, owing to the humidity of the climate or to the facilities offered for irrigation, long stapled cotton, even at present prices, is more profitable than short-stapled and short season cottons grown in less favoured tracts.

521. From the experience gained by us in the Central Provinces, it would appear that it would not pay to grow long-stapled cottons such as buri and bani or jari cotton of mixed staple in preference to roseum, unless a premium of about 70 per cent. for buri, 106 per cent. for bani and 31 per cent. for jari were paid. If given that premium for the lint of buri, it would be possible to grow a few thousand acres of this variety on the best deep black soils of the cotton tract. Our experiments in which we compared the relative yields of buri and roseum were carried out on land that was not infected with wilt. In wilt infected areas the outturn of buri is much more nearly equal to that of roseum, and for that reason we have for years been recommending its cultivation in such areas. In the rice tract which includes all Chhattisgarh Division, Balaghat, Bhandara, Chanda, and part of Nagpur, there are large areas of soil derived from laterite and crystalline formations which, being very porous, are quite suited for cotton cultivation, despite the fact that the rainfall of this tract is much above the average rainfall of the cotton tract. On this class of soil an outturn of 770 lbs. of kapas per acre was obtained from a field of roseum grown on the Sindewahi Farm in 1913-14. On the Chandkhuri Farm, where we have been growing Cambodia for the last four years on a lateritic soil locally known as bhata, in three years out of four the yield of cotton was good. It suffered in the fourth year from an attack of caterpillars. We are now trying this same long stapled cotton, viz., Cambodia, in other parts of Chhattisgarh on soils considered to be below the margin for cultivation. About 1,000 acres of Cambodia are to be grown by cultivators in Chhattisgarh on these poor soils this year 1918-19. We hope that the area will go on doubling every year so long as the prices remain high. But even at pre-war prices, it would pay handsomely to grow cotton on this land which up to the present has nearly all lain fallow. The area will increase faster, if prices remain at the present level. There will be a steady increase, but it will not be a startling one. The cultivators of this rice tract are most backward and unenterprising, and cotton is to them an entirely new crop. We hope, however, that in the course of five or six years, it will be possible to work up to an area of ten or twelve thousand acres in this tract.

522. It is true that in the ordinary jari mixture there is sometimes twenty per cent. of American cotton.
This exotic variety was introduced in the sixties when an attempt was made to grow it pure, but cultivators have long since ceased to take an interest in this long stapled variety. It has been grown pure by the Department on Government Farms, and our experience has been that the lint is so very weak that it does not fetch more than good jari. This and other varieties were introduced in the sixties by the Cotton Department of which the head was Mr. Rivett Carnac who was designated "Cotton Commissioner for the Central Provinces." On the abolition of the Cotton Department about 1873, cultivators ceased to take any further interest in exotic cottons. Upland Georgian had been grown on a considerable scale, however, and its seed had got irretrievably mixed with that of the indigenous cotton. No system of seed selection is practised by cotton growers in these provinces, and the result is that, when a cotton of this kind once gets introduced, there is little chance of its being got rid of again.

523. In East and West Khandesh, the cotton grown is almost exactly similar to that which is found in the Central Provinces. When I made a classification of the cottons of the provinces eight or nine years ago, I found that the percentage of Upland Georgian in the jari mixture varied considerably in different parts of the provinces. It is higher in Berar than in the north of the provinces. From Akola I got a sample containing 49 per cent. of Upland Georgian. This I attribute to the fact that in Berar there are now considerable areas of land which are badly infected with wilt disease, and that there is a practice in vogue by which cultivators keep the seed of cotton grown on these areas. Upland Georgian like buri is immune to wilt, and the result is that by growing jari cotton on lands so affected, the percentage of Upland Georgian in it tends to increase by leaps and bounds. Some cultivators who have given up the cultivation of buri as a pure crop, still make a point of sowing it as a mixture with roseum in their fields affected with wilt. In years in which wilt does not do much damage, roseum is a good crop. When it is badly affected by the disease, the buri survives. I am not sure how much of the whole cotton area in the provinces is infected with wilt, but I am of the opinion that it does not exceed one or two per cent. Buri is a better cotton than Upland Georgian, as it gives a higher yield of kapas and a slightly higher ginning percentage.

524. Roseum cotton is now well-known all over the Provinces as a heavy yielder, and cultivators are prepared to pay a high price in order to get pure seed. Bani is not now grown as a pure crop in any part of the provinces, but it is found as a mixture in jari in the southern portion of Berar which is far from the railway and where, owing to the difficulty of getting pure seed, it has not yet been found possible to grow roseum. Pure bani is still grown in parts of the Nizam's Dominions, I believe. It still survives in tracts which are backward agriculturally just as kodo, one of the inferior millets, is grown on a large scale on good land in the more backward parts of Chhattisgarh. At present prices bani in the Nizam's Dominions is certainly much less profitable than roseum would be if grown there. In a notice compiled by Mr. Schofield of the Revenue and Agriculture Department, about 1866 when bani was grown absolutely pure, the normal yield of clean cotton is shown as being 34 lbs. per acre only. In my opinion bani is likely to disappear in a few years in the Nizam's Dominions from all tracts where the climate resembles that of the Central Provinces.

525. I do not think that the danger of roseum spreading in tracts which at present grow long stapled cottons is one to be guarded against. Cultivators will not grow it unless they find that it pays them better than other varieties. I do not think that the price at present paid for roseum is an artificial one. It is

... a supply of a longer staple

526 The soil of the Akola Farm is typical of the best black soil in Berar It is deep and retentive of moisture and for that reason *buri* has done better there than on lighter soils in other parts of the Division

... is already grown there on a large scale and meets the requirements of the cultivator admirably in so far as it supplies him with food grain for himself and fodder for this cattle There is no

... on a large scale *Tur* (*Cajanus indicus*) is sometimes grown as a pure crop but is more often sown with cotton So long as cotton continues to be as profitable as it is at present, the cultivator will hesitate to grow purely leguminous fodder crops

527 We have been experimenting with different crops grown in rotation with cotton in order to ascertain which is the most profitable for the cultivator to grow Curious to say the result of the rotation series for the last ten years on the Akola Farm indicate that the highest acreage profit is obtained by growing cotton not in rotation with another crop but year after year on the same field. This system no doubt has its disadvantages, as continuous cropping with cotton tends to intensify the damage done by wilt disease

528 ...

530 My estimates as to the relative outturns of *roseum* and *buri* cottons are based on the results obtained on experimental farms and on returns obtained from co operative seed unions and seed farms Where the varieties of cottons are being tested on an experimental farm each variety is grown on a different plot of the series every year so as to reduce as far as possible the experimental error The yields of the different varieties grown on the Akola Experimental farm are average for a period of ten years

531 About seventy per cent of the cotton produced in the provinces is grown in Berar There is not much variation in the soil and climatic conditions from district to district in this division. The rainfall varies from about 33 inches in Akola to 40 inches in Yeotmal, but the period of rainfall is the same all over the division. We have not repeated these varietal experiments in districts other than Akola, but they

have been tested by the owners of seed farms who are convinced from the results obtained that *roseum* is easily the most profitable cotton to grow. This corroborates the results obtained on the Akola Experimental Farm.

532. As regards the question of improving cotton by hybridization, I may say that I doubt whether much can be done in this direction. It would be advisable, however, for the Economic Botanist to take it up when he finds time. In the past he has devoted most of his time to the study of rice and *juar.* A great deal of work in cotton breeding has been done by my staff on the Akola and Telinkheri farms. We have invariably found that, when a long-staple cotton such as *bani* is crossed with a short-staple cotton with a high ginning percentage, the hybrid fails as a rule to have the two good qualities at which we aim, *viz.*, length of staple and a high percentage of lint. It may yet be found possible to produce a hybrid in which these two qualities are combined, but I should like to point out that it has not yet been accomplished anywhere in India. Of the thousands of crosses which we have produced only two or three are of any promise. Of these, the Sindewahi cross is now being tried on a field scale but the lint is not quite uniform as yet, though the plant is absolutely fixed as regards its leaf and flower characters. The ginning percentage of this cross ranges from 35 to 36. This cross is being grown by cultivators this year for the first time. It is being tried in 21 villages in Chhattisgarh where it is grown with irrigation. It is an early cotton, and should do fairly well in the cotton tract without irrigation. It will be difficult to substitute any cotton of this kind which is only slightly better than *roseum* for that heavy yielding variety which is now so much appreciated by cotton growers. Much will depend on the price which the buyer is prepared to pay for the better lint. If the premium paid is sufficient to make it worth while for the cultivator to grow it, he will do so without doubt. The Sindewahi cross is a cotton of better staple than *roseum* as one of the following valuations will show:—

1912—	*d*
Buri	6·9/16 per lb. value at Liverpool.
Bani	6·3/8 „ „ „ „ „
Roseum	5¼ „ „ „ „ „.
Valuation for 1915:—	
Cambodia	Rs. 124 per *bhoja* of 392 lbs.
Roseum	70 „ „ „ „ „
Sindewahi Cross	92 „ „ „ „ „

533. Cotton wilt has done a good deal of damage in small concentrated areas, more especially in Berar. It will, I believe, tend to spread so long as cotton-growers continue to grow cotton year after year on the same field as some of them do. I have given a good deal of attention to the question, and have worked out the percentage of plants affected with this disease in infected villages in different districts. Specimens of the plants affected were sent to Dr. Butler, Experiments were also carried out to ascertain the relative immunity of pure *bani*, *buri* and *jari* cotton to this disease. The *buri* was found to be immune but *jari* and *bani* were about equally susceptible. I am not in a position to say to what extent the yield of cotton for the whole province is reduced by this disease. Cultivators, in order to reduce the damage done to a minimum, use a higher seed rate in wilt infected areas or they sow *buri* or Upland Georgian as a mixture with the *jari* in such areas. When once the disease gets established in a field, it continues to damage the crop year after year. It has been found in America, I believe, that its ravages can be reduced very much by rotating cotton with other crops and that after cropping affected areas with other crops for at least six years the virulence of the disease is very much reduced.

534. Boll-worm is not a very serious pest in the Central Provinces. An experiment carried out on the Telinkheri Farm some years ago showed that about eight per cent. of the plants were affected by boll-worm. It was found on the same farm that *bhindi* sown with cotton as a trap crop reduced the damage done by this pest to some extent, but the remedy was not an economical one. In the neighbourhood of towns where *bhindi* is in demand in large quantities as a vegetable, it may be possible to use it economically as a trap crop in areas affected by this pest. But as I have already said, boll-worm cannot be regarded as a serious pest in these provinces.

535. Exotic cottons such as Cambodia, *buri* and Upland Georgian suffer from red leaf blight in October. This blight is, I believe, due to the physiological condition of the plant resulting from the sudden cessation of rains followed by hot sunshine in that month. The leaves affected get red, wither and drop, and this necessarily checks the growth of the plant. Indigenous varieties remain green throughout the cold weather. Picking starts as a rule, in the third week of October, and is finished by the end of January. Later pickings are obtained when the cold weather rainfall is good. The growth of the cotton plant is checked not by cold but for want of moisture. Where irrigation facilities are available, cotton continues to yield till the end of March. We stop irrigating and picking after that month for the reason that, owing to the excessive heat, the plant, while yielding much less cotton, requires much more water. Long seafon exotic cottons such as Cambodia are benefited to a greater extent by irrigation than short season cottons like *jari*. *Jari*, even when irrigated, gives at least two-thirds of its total yield before the end of December. Cambodia on the other hand gives more than half its total yield after that date.

536. (*Mr. Roberts.*) The position of affairs when I took over charge of the cotton work in the provinces, was that, though many efforts had been made to grow long-staple cottons, no real attempt had been made to go into the question of profit and loss to the cultivator. My first work was to classify the cottons grown and to ascertain their outturns and ginning percentages. Having picked out the most profitable cotton for the ryot to grow, the next step was to get it propagated on private seed farms run by individuals or co-operative unions. Similar efforts are now being made to extend the cultivation of *roseum* in parts of the United Provinces and Bombay Presidency. The total annual yield of cotton for the provinces is about one million bales. I do not consider that the quantity of short-stapled cotton grown is ever likely to be in excess of the demand. In Japan, the number of spindles is being increased as fast as possible and the quantity of cotton imported from India is increasing every year; the demand for Indian yarn in China, too, shows no signs of decreasing.

537. The difference in quality between the lint of *jari* and of *roseum* cotton is very little. *Roseum* is slightly inferior in quality to *malvense* and *verum* which are two of the *neglectum* types which constitute the *jari* mixture. It is, on the other hand, distinctly superior to *cutchicum*. Pure *roseum* is therefore of

better quality than a *jari* cotton containing a very high percentage of *cutchicum* but slightly inferior in quality to a mixture containing *malvense* and *verum*. The percentage of *bani* in the mixture is ordinarily so very

already done some work on crops He is of opinion, I problem

has to these other will be a difficult

Some are light and readily lose that the price of cotton has gone *Roseum* does very much better in rich heavy soils in which *jari* and *roseum* in different classes of private seed farms Their opinion areas than *jari* In dry years,

hot October is fatal to this variety

540. The figures showing the relative outturns of the different cottons as given in my written evidence relate to the results obtained on the Akola Experimental Farm, the soil of which is typical of the best heavy black soil in Berar On that farm we have grown cotton on the same land for eleven years in succession. Rotation will have to be practised to a The different varieties of cotton under

541. It will take a long time to get the whole cotton tract sown with pure *roseum* for the reason that the ordinary cultivator as a rule, sells his cotton as *kapas*, and the seed is not kept for sowing purposes. *roseum* cotton for not always pure, as s. Big landowners percentage which is being distributed are seed is supplied of staff to supervise unions and seed ear, is the supply ped to be able to of our labours the cotton is also being area under pure *roseum* is increasing every year, and the ginning for *roseum* sown with the variety increased. g our agencies for seed propagation within the unions and 26 unregistered unions as fast as all staff, but good progress is being at the present time. At present we are working made nevertheless, as the demand from the people for seed is very great. They know the intrinsic value of this cotton and do not require to be pressed to grow it. The actual premium paid by buyers for As the cultivator sells his cotton as *kapas* e higher ginning percentage which it gives in it for themselves. We also wrote to to purchase the *kapas* and to give a them at certain markets. *Their reply was* rs in big centres only When cultivators more for it per *khoji* of 392 lbs. than for *jari* but. Large buyers who buy for export are prepared to pay more for clean cotton of good colour; to the staple. to the Empress Mills, but to their agents who purchase

543. We have tried *guar* es) as a fodder crop.

544 We have private cotton seed farms in every *taluk* of the cotton tract. On these seed farms, *roseum* seed is propagated by the owners and sold direct to cultivators the following year, but no attempt is made

to sell at the seed of the cultivators' crops. [illegible]

545. [illegible]

546. [illegible] That pure *bani* is still being grown in parts of the Nizam's Dominions [illegible]. It is due, I believe, to the fact that the cultivators there are very backward agriculturally and still continue to grow a comparatively unprofitable variety, because they have not yet been able to get seed of a more profitable kind.

547. Our organisation of Agricultural Associations started with the District Associations of which the Deputy Commissioner in each district was the president. Members of these District Associations were not carefully selected, and few of them took any real interest in the objects of their Association. Taluk Associations were formed later. The men selected for membership were leading land-owners who had shown interest in improved agriculture. Many of them were the owners of private seed farms. The President of the Taluk Association is the Tahsildar. When our cooperative agricultural seed unions were formed, most of the members of these unions also became members of the Agricultural Association of their Taluk. The Taluk Association meets twice or thrice a year. Each Taluk Association has its representatives in the District Association which meets once a year under the presidentship of the Deputy Commissioner. The Divisional Meeting of the District Associations is held under the presidentship of the Commissioner at the time of the annual Divisional Show and Conference. A few of the Taluk Associations are now employing their own *kamdars* who carry out a certain amount of propaganda work in villages and who book orders for improved seed, implements, etc., stocked by the Taluk Association. Grants of from Rs. 1,000 to Rs. 1,200 are given by some District Boards for the improvement of agriculture. This money is divided between the different Taluk Associations of the district. The money is being utilised for the payment of the *kamdars* employed by these Taluk Associations.

548. (*Mr. Hodgkinson.*) I said yesterday that America would after the war increase her outturn of cotton. This, I believe, she can do by more intensive cultivation. I have seen it stated that America is reaching the limit of the area which she can put under cotton. I am also aware that the question of labour is becoming a very serious one in America. On the other hand, they are trying to introduce cotton picking machines there which will, if successful, solve the labour difficulty. These have, I understand, not been a success so far. As to whether Lancashire would benefit more by India increasing her output of long-stapled

cotton by 100,000 bales or her output of short stapled cotton by 500,000, I am of the opinion that in the interest of Lancashire an increase of 100,000 bales of long stapled cotton would be preferable, but in the interests of the cultivator in the cotton tract of the Central Provinces, I would prefer to concentrate our efforts very largely in increasing the outturn of the shorter-stapled but more profitable cotton which we are now pushing. Where irrigation is available, we shall, of course, continue to push the cultivation of long stapled cotton, where it pays the cultivator to grow it

549 The average yield of a normal crop of cotton in the provinces is about 280 lbs per acre which is equivalent to an outturn of about 95 lbs. of lint. From the statistics published in the eighties it would appear that the outturns were only little over half of these. In a note compiled by the Revenue and Agriculture Department of the Government of India, I find, for example, that the yield of lint per acre in 1881 was 29 lbs.; in 1882 it was 40; in 1883 it was 57¼; in 1884 it was 41 and in 1885 it was 54 The large increase in yield is due mainly to the fact that *bani*, which was the cotton chiefly grown at that time, has been ousted by the much more prolific *jari* The cultivation of cotton has also become more ... o doubt, and the yield could be increased still further by better cultivation ... m has increased the acreage yield by about 30 lbs. of lint on ... n could certainly be doubled by more inten... 700 lbs. of *roseum*

W... tract but the estab... a larger number of ... crops so that he will have ample ... Central Provinces. ... Agricultural Chemist I do not consider ... Deputy should have an Assistant Director to assist him This staff would suffice for the next ten years ... Our Botanist has already completed the ... at least one for each division is urgently needed and each ... time in future to devote to plant breeding

552. (*President.*) In forecasting the outturn of cotton for the year, the methods which we employ is as follows. A field is selected in each cotton growing *taluk* where the crop represents the average crop of the year. In this field a plot of one tenth of an acre is selected The number of plants in this plot is counted, and the average number of bolls, flowers and buds on 100 plants is ascertained. From this we deduce the total number for the whole plot Knowing as we do the weight of cotton given by a known number of bolls, flowers and buds in the previous year, we draw conclusions as to the yield of a plot this year Allowance has to be made for a certain amount to loss, owing to buds and flowers failing to mature This is a formidable source of error, as the number which falls in any one year before maturing is largely dependent on weather conditions which cannot be forecasted. For the first three years in which we employed this method our forecast was fairly accurate. The error never exceeded six per cent. This new system was started four years ... Before that, the Settlement Department prepared the cotton forecast The Commissioner of Settle... ts used to rely on the information supplied by Revenue Inspectors and *patwaris* as to the state of the ... in their circles They gave the outturn in the American notation which showed how much the crop ... better or worse than that of the previous year Our forecast last year proved inaccurate The heavy ... ll at the end of November damaged the crop to such an extent that a large number of immature bolls ... ed.

...3 I have not experienced any difficulty in obtaining fortnightly returns from gins and presses. These ... are sometimes sent in late in which case they are published along with those of the following ... t These returns should, in my opinion, be made compulsory To facilitate the clerical work ... l in sending in these returns, we supply the managers of gins and presses with postcards so that they ... rely to fill in the figures in the blank spaces.

Those who were consulted regarding the advisability of publishing Bombay and Liverpool prices ... ton markets have given it as their opinion that this is not necessary for the reason that these prices ... t to all the buyers between whom competition is so keen that they have to offer top prices The ... at, allowing for freight charges, there is very little difference between the market price here and ... nbay on the same day for the same quality of cotton. I doubt therefore whether the cultivator ... enefited to any extent by publishing these prices in our local markets Where the cultivator ... n the buyer goes to his village and buys his cotton there, thereby preventing him from coming ... t real market value of his cotton is

... o not consider that the appointment of an Imperial Cotton Specialist is ever likely to help us ... improving the cotton industry in India Improvement must come from within, and can only ... effectively in a province by a staff of experts working therein What we want is to increase ... erts in the cotton growing provinces rather than to appoint one Imperial Expert for all India. ... ld, in my opinion, be advisable to have a permanent Standing Sub Committee of the Board ... onsisting of Botanists and Deputy Directors actually employed in the improvement of cotton ... ives of the trade and shipping interests and possibly a permanent president. The ... would be co ordination and generally to keep in touch with ...

... dvisable to provide in Bombay some agency to ... the Central Provinces to Bombay contains, if not ... ture. It absorbs moisture in Bombay where the ... otton purchased in a dry tract is thus worth ... a tract where the humidity is greater Buyers ... g the water while the cotton is still in their h... nsider

Supplementary written statement submitted by Mr D Clouston.

... ilities of growing long-stapled cotton in the rice tract in 1918 1919, submitted to the —Central Provinces Administration on November 27th, 1917

... und with the Cotton Committee and sitting in the witness box for most of one after... r, I am convinced that in the interests of the Empire we should do what we can to ... on in the Central Provinces. To put the position in a nutshell, America is increas... ndles at such a rate that the time is not far distant when she will be able to spin

[illegible]

558. [illegible]

559. [illegible]

560. [illegible]

561. [illegible]

562. [illegible]

563. [illegible]

Rao Bahadur K. J. DESHMUKH, Landholder, Amlya, and Vice-Chairman, Taluk Agricultural Association, [illegible].

[illegible], 1917.

[illegible]

I.—[illegible]

(a) "*Deshi*" [illegible]

564. **(1) Experience.**—I have lived in [illegible] with cultivators.

565. **(2) Varieties.**— [illegible]

566. **(3) Size of holdings.**—The [illegible] the above holding is under cotton cultivation.

567. **(4) Yields and profits.**—The average yield [illegible] Rs. 15 per acre.

568. **(5) Rotations and manures.**—*Kadbi* is the general crop for rotation, but it has no [illegible] value at all, and it exhausts the soil. Other rotations which are beneficial for cotton cultivation are tobacco, *til*, groundnut, *bajra*, and linseed.

569. **(6) Comparative returns.**—The return of *deshi* short stapled cotton as compared to *deshi* long stapled varieties, namely *bani* and *buri*, is superior.

570. **(7) Conditions affecting increase in area.**—The area under *deshi* short stapled cotton is gradually increasing for the last twenty years, because the cultivator gets the crop earlier and at the same time more in value than the other varieties of crops. Besides this, the crop is not affected to that extent by short rainfall as is the case with other crops.

571. **(8) Uses of seed and seed selection.**—The cotton seed is used for (1) Feeding cattle. (2) Extracting oil. (3) Sowing purposes. In general, seed selection is not practised on any scientific principle. Seed farms and unions distribute pure *roseum* seed. Seed selected for sowing is not specially hand ginned. From a monetary point of view, the effect of cotton cultivation has been desirable for the last 25 years, but at the same time, the spendthrift habits of the uneducated cultivator have much increased and so the general condition of the agriculturist is not satisfactory.

To remedy the evil—

(i) Agricultural education in the secondary and high schools should be imparted and that too in the vernacular

II —COMMERCIAL ASPECT

In my opinion, the present system is fully perfect and advantageous except in the following respects —

573 (32) Buying agencies —In my opinion, there are practically no buying agencies in India The present agency of purchasers is more or less a sort of buying commission agents This system works to the disadvantage of cultivators because there are several factors such as *aratyas* commission purchasing ... It would be advantageous if attempts ... purchased by ... ore the bales ... whole scheme should work on a co operative basis.

III —STATISTICAL

... Deputy Director of Agriculture The second forecast of the condition and progress of crop should be published at the end of September October and November and should state the prospects of the yields in annas and cents

575 (34) Improvement of other statistical information —From the month of November the reports of ... of bales exported by rail ... d of each week printed ... all the cotton markets ... market should get at its cost wires of daily prices of cotton from Bombay marktes Copies of such telegrams should be pasted in the cotton market for the information of the public concerned

IV —MANUFACTURE

(a) *Ginning and Pressing*

577 (36) Type and number of gins —I have got two ginning factories consisting of eighteen gins of Platt Brothers make.

578 (42) Effect of replacemet of short-staple cotton by long staple —No substantial alteration in the machinery will be necessary if long stapled cotton is introduced.

Rao Bahadur K J DESHMUKH called and examined

579 (*President*) I am the Vice Chairman of the Taluk Agricultural Association I have no official connexion with the cotton market but I am an *aratya* As to the various improvements that I would suggest in the method of marketing I have given my ideas in my written evidence I would have an inspector to

check the weights. *Aratyas* are often not men of experience or of status because a license is given to any man who applies for it. I would suggest the consideration of the following :—Arbitration, appointment of an inspector of weights, appointment of qualified men as *aratyas* and the alteration of the *khandi* because it is very difficult to work under the present system. Formerly there were twenty maunds to the *khandi* and then it was easy to calculate even by the uneducated cultivator. A *khandi* of twenty-eight maunds is peculiar to the Central Provinces and outside the province it is twenty. A *khandi* of twenty-eight maunds is very unpopular. The *khandi* was changed about two years ago under the orders of the Commissioner to the cotton market committee. It was changed owing to the standardization of weights. Fourteen seers make a maund. There are therefore 392 lbs. to the *khandi*.

580. In regard to buying, I would suggest cotton purchasing banks. The disadvantage at present is that the cultivator as soon as he gets his crop from the field, brings it at once to the cotton market. He has no convenient method of storing it. So there is a sudden rush lasting for two or three months and the *kunbis* (cultivators) have to sell their *kapas* at the option of the buyers. Cotton purchasing banks would enable the *kunbi* to hold his cotton up for a better price. The banks would have facilities for ginning, pressing and storing and would only sell the cotton when a fair price was obtainable. The market this year opened with cotton at Rs. 140 per *khandi* or even Rs. 137. Now the rate is Rs. 170 per *khandi* and the *kunbi* has therefore had to lose about Rs. 60 each cart unnecessarily. Had there been a bank, such would not have been the case. If there is no rush, there is no chance of the value going down. The stock of bales would be sold in lots and there would be a fair demand from Bombay. At present about one hundred to two hundred bales are despatched to Bombay, retail selling.

581. As to forecasts, I have suggested another method of framing them and I have said that the dates of publication are not suitable. I think that they should be published at the end of each month. In July, the forecast should state the net area under cotton. In August, September, October and November, the condition of the crop should be stated as well as the area. We should still have the February forecast. In December, the forecast should show the arrivals in each market. The forecasts should be attested by *panchayats* and by the members of the Taluk and District Associations, so that they will create more confidence.

582. The Chairman of the Taluk Agricultural Association here is the Tahsildar. It was founded in 1914. Formerly there was a District Agricultural Association but as it had a meeting only once a year, practically very little could be done. It consisted of about 25 to 30 members, *i.e.*, five or six members from each *taluk*. It was too big and the members were too busy and had no time to explain its objects to the people in the district. By forming smaller Taluk Associations we have enlisted the sympathy of many agriculturists in each *taluk*. Each *taluk* is divided into groups of about twenty groups, each group being in charge of a circle member. The circle members explain the objects of improved implements and if there is any demand, they communicate with the Secretary of the Association, who supplies from headquarters, such implements as winnowing machines, ploughs on hire, etc. These are found to be of great advantage to the cultivator. Seed is supplied as well also copper sulphate. Advice on all agricultural matters is also furnished. We have a managing committee, that is the working body. In order to have a fund from which to purchase implements, we have just started a class of patrons, who give a donation of Rs. 25 to the Taluk Association to enable us to purchase improved implements. Besides these, we have got members paying a subscription of Rs. 2, and "sympathisers" paying Re. 1 to the Association annually. Regular accounts are kept and scrutinised. I recommend that these Taluk Associations should be registered under the Co-operative Act and that they should work on a share system, because this year we purchased ploughs worth Rs. 300 and the profit we made by hiring them out was Rs. 100, *i.e.*, one-third of the investment made. My idea is that those associations, who do good work, should be given some grants from the Agricultural Department for the purchase of implements, because at present, as they have to depend on the public for their funds, the progress made is not satisfactory. It is now rather a charity affair. By getting these associations registered, we should be able to give some dividend to the agriculturists and they would begin to take more interest in these associations. Grants should be made by Government for starting libraries and museums. Half the cost at least should be contributed by Government.

583. (*Mr. Wadia.*) I have suggested that two persons on the buyer's side and two on the seller's should be arbitrators in disputes. Their decision should be final. There should be a rule in the cotton market law, making it a condition of a license, that the licensee should act as an arbitrator whenever he is called upon to do so. There should be a rule, making both purchasers and sellers work as arbitrators whenever they are called for to do so, but they should not be concerned in the transaction.

584. (*Mr. Henderson.*) About three annas or rather less than one-fifth of the total crop which comes into the market is pure *roseum*. The mixed *roseum* is about four annas, *i.e.*, about a quarter of the crop. The cultivators are pleased to pay an extra price for seed. All the Seed Unions at Khamgaon this year sold the seed at the rate of Rs. 35 per *khandi* when the price of ordinary seed was only Rs. 15 to Rs. 18.

585. (*Mr. Roberts.*) We do not find any difficulty in selling all our seed. We cannot cope with the demand. In the beginning, we had to call for the assistance of the revenue authorities in selling our seed but for the last two or three years we have been selling it independently and cannot meet the demand. The cultivators come in for it. The total quantity of seed which we sold last year was about 50,000 lbs., sufficient to grow about six to seven thousand acres. Our seed farms, *i.e.*, central farm and branch farm amounted to 300 acres altogether. I cannot say how much we sold from the central farm last year. The 50,000 lbs. I mentioned is for the branch farm as well as for the central farm. I find the same customers come again every year but there are also new ones as the reputation of the *roseum* seed spreads. Roughly the proportion of new customers might be about twenty per cent. In reality, my business is to keep an area of five to six thousand acres pure within my immediate reach. I have not very much influence outside my circle. We only supervise the area of the branch farms, and once we sell the seed produced on the branch farms we do not follow it up. The cultivators come back to us again for fresh seed. They sell the *kapas* directly to the merchants in the market and they come back to us for fresh seed except in a few cases where the cultivator wishes to get his *kapas* ginned for himself. Some cultivators wish to have their good *kapas* ginned as they do not want to pay a higher price for the seed. The Associations certify the purity of the seed. The cultivators sell their *kapas* mostly direct to the merchants because they are poor people and want the money at once. The cultivators would prefer to come to the association for seed than go to a person who is not responsible to any one. They sell the *kapas* because it is too much trouble to get it ginned separately and also because it means waiting for the money.

Thakur KISHORE SINGH, Malguzar of Mauza Jaswadi, Nimar District.

THIS WITNESS WAS NOT ORALLY EXAMINED

Written Statement

I.—AGRICULTURAL EXPERIENCE

(A)—"*Deshi*" *short staple cotton*

586 (1) Experience —I am a resident of Mauza Jaswadi of Khandwa Tahsil in Nimar District which is a cotton tract I have been living there ever for 58 years I am in touch with cotton growers and I am

Receipts

	Rs	A	P
Cost of 15 maunds at Rs 100 per *man* (=12 Bengal mds) at 5 maunds per acre per year for three years	125	0	0
Expenditure			
Two ploughings at Re 1 4 per day for five days	6	4	0
Fifteen cart loads of manure at Rs 2 per cart	30	0	0
Charges for *bhakkaring* twice at Re 1 per day for five days	5	0	0
Picking of cotton stalks	0	5	0
Cotton seed, ten seers	1	0	0
Hoeing three times	2	4	0
Weeding, 18 coolies at As 4 per day	4	8	0
Picking of cotton for five maunds at Re. 1 per maund	5	0	0
Land revenue	2	0	0
TOTAL	56	5	0
Expenditure for second year excluding the cost of manure, Rs 30, and the ploughing Rs 6 4 0	20	1	0
Expenditure for the third year excluding the cost of manure, Rs 30 and the ploughing Rs 6 4 0	20	1	0
GRAND TOTAL	96	7	0

	Rs	A	P	
Receipts	125	0	0	
Expenditure	96	7	0	
	28	0	0	profit for three years

h *juar*, *tur*, *urid*, *mung* and gram.

ort staple cotton is comparatively higher than the profits per acre from *deshi* long staple cotton, exotic cotton and other *deshi* crops as shown in the following statement :—

	Rs.	A.	P.
Income from an acre of short staple cotton (five maunds)	41	4	0
Long staple cotton, yellow flowered, per acre (three maunds)			
Exotic cottons, *buri* and Upland Georgians, give as much as the *deshi* short-staple This requires a rich soil and good rainfall			
Other crops per acre (five maunds) give a gross income of Rs 20 which includes the value of fodder, etc			

592 (7) Conditions affecting increase in area —The cotton area in our tract fluctuates every year. It depends on the favourable rates prevailing If one year the prices are high, there is a corresponding increase in the area of cotton of the following year And if, on the other hand, the rates of cotton are below normal and also in the event of the rise in prices of staple food grains, there is a decrease in the cotton area next year

593 (8) Uses of seed and seed selections —Cotton seed is used for sowing and feeding cattle Some seed is taken away by traders from outside Seed selection is not generally practised. Hand ginned seed is val ted

the loss per acre.

(5) "*Desi*" [illegible]

595. **(10) Experience.**—Long-staple cotton [illegible] variety of this cotton is now found in the [illegible]

596. **(17) Prevention of mixing of different varieties.** [illegible] of one variety of cotton with other [illegible] seed for [illegible]

597. **(28) Importation of seed.** [illegible] tion of foreign seed will be worth while.

598. *General.*—In my opinion [illegible] in general and the [illegible] farms on the lines of those worked by the [illegible] the appointment of an Agricultural A[illegible]

II [illegible]

599. *Organisation.*—[illegible] would be an useful adjunct to the [illegible]

600. **(30) Local trade customs.** [illegible] traders generally [illegible] settlement of rates with cultivators [illegible] favourable [illegible] delayed for [illegible] cultivators [illegible] to traders [illegible] opportunity of [illegible]

(2) The [illegible] market and [illegible]

601. **(31) Standardisation of commercial names.** [illegible] cotton in [illegible] in the Nimar District [illegible] adjoining district [illegible] quality, and the traders [illegible] [illegible]

602. **(32) Buying agencies.**—[illegible] for be paid for the cotton [illegible] the safety of the cotton [illegible] against.

III [illegible]

603. **(33) Improvement of cotton forecasts.**—[illegible] extent [illegible] The [illegible] estimates on [illegible] a representative village [illegible]

604. **(35) Publication of Liverpool and Bombay prices.**—[illegible] market reports will tend to [illegible] the cotton trade.

The Hon'ble Mr. B. P. STANDEN, C.I.E., I.C.S., Commissioner, Berar Division.

THIS WITNESS WAS NOT ORALLY EXAMINED

Written statement.

605. **(1) Experience.**—I first came in touch with cotton cultivation when appointed Director of Agriculture in 1901. I served in that capacity for two years until 1905. Since December 1911, I have been Deputy Commissioner for three months and Commissioner for the remainder of the time in Berar.

606. *Area under cotton in Berar.*—In the four years ending 1915-16, the average area under cotton in Berar was 3,115,000 acres. This represented 44½ per cent. of the area under crop in those years. The greater part of the black soil area of Berar is so quickly drained after rain that it will not grow *rabi* crops unless the season is exceptionally wet. At the end of the cycle of wet years which ended in 1895-96, there were 1,039,000 acres under wheat and 786,000 acres under other *rabi* crops. The price of cotton was at that time low. The normal area of cotton at the time was about two million acres, so that with seasons very favourable to *rabi* and a low price for cotton we had about a million acres less cotton than we have now with seasons generally more favourable to cotton and *rabi* and a very high price for cotton. If we again got a cycle of wet years or if prices fell largely, we might expect a reduction in the cotton area. For instance, after the low prices of 1914-15, the area fell from 3,180,000 acres to about 2,800,000 acres. I think we cannot expect any appreciable increase in the cotton area. The record area was, I believe, that of 1913-14, when it reached nearly 3,300,000. The price of *juar* and *karbi* has now reached such a high figure that *juar* is not much less profitable than cotton to cultivate and cotton cannot be further substituted for *juar* without causing considerable inconvenience to the cultivating classes.

607. **(3) Size of holdings.**—Our revenue papers show the areas held by individuals in each village. An examination of these papers shows that the average area held by individuals in a single village may be put at about ten to fifteen acres in the best parts of Berar, twenty to twenty-five acres in the open hilly parts and thirty-five to forty acres in the small area in the south-east of Berar, in which there is still a good

deal of forest and many of the holdings have not been long in occupation. But there are of course many

holding per individual is

evenue These men hold

On the other hand, most

of fifteen to twenty acres.

[illegible] has been supplied by the Agricultural Department we can do nothing appreciable in

Central Provinces and Berar.—It may be of

being used to introduce *roseum* cotton, since

[illegible] employed in the [illegible] and

per

new

Berar

arms

in the

[illegible] that

quiring the seed farmers

beneficial in their effects

was ordinarily purchas

fourth year therefore after a crop is sown on a large scale on the Government farm, [illegible] if properly managed are essentially

under the Co operative Societies Act, and registered. Up to date only eleven Unions have been registered out of 37 established Those that have been registered have been regarded as subor- [illegible] some delay

for a large measure of protection [illegible]

exactions. The arrangements for these markets are described in my letter dated the 8th May 1916, to the address of Mr. Low, Secretary to the Government of India, a copy of which is attached. The commercial classification of Berar cotton [illegible] the place from which the bales are despatched to Bombay. [illegible] because it is despatched from Khamgaon. [illegible] their bales to Khamgaon for despatch [illegible] carried by cart eleven miles to Khamgaon [illegible]. Last year some cotton was sent from Central India to Berar [illegible]. Berar cotton although properly classified as Berar [illegible] be more or less obsolete [illegible] considerable quantities of [illegible] cotton were grown in the [illegible] of Berar and [illegible] the Nizam's Dominions [illegible] cotton of the plains of Berar. [illegible] south of Berar was despatched [illegible]. At present, I think, there is [illegible] difference in the quality of cotton [illegible] from the south of Berar [illegible], but I believe it is very slight. To abolish [illegible] to the improvement of cotton, though it would [illegible].

(2) Mixture of [illegible] to clean [illegible] and I tried to get the [illegible], as the Bombay buyers of the mixed cotton [illegible].

(3) In order to [illegible] to ensure that they should get the full value of [illegible] at present from Rs. 2 to Rs. 4 per [illegible] the full value of [illegible]. It [illegible] Rs. 2 to Rs. 4 for [illegible] Rs. 12 last year. [illegible] in the press of work, cotton buyers [illegible]. They are, no doubt, [illegible] attention to warrant them to pay [illegible].

(4) It was resolved at the Agricultural Conference held at Akola in [illegible] that the Deputy Director of Agriculture should consult with the [illegible] the full value of the [illegible]. But the Deputy Director of Agriculture [illegible] Deputy Director of Oilseeds and I have not heard [illegible].

611. *Classification of cotton in Berar.* At present cotton is classified in Berar Land Records as long staple, short staple and mixed staple. [illegible] has not been separately [illegible]. The [illegible] (village accountants) should [illegible] between the [illegible]. The Director of Land Records is doubtful [illegible] unless considerable areas are [illegible] because the Agricultural Department have full information as to the quantity of seed sold from [illegible]. The matter is of some importance [illegible] and eleven per cent. more lint [illegible]. It is also important for the Department to know how it progresses in various parts of the country. I may say that [illegible] that the area under fairly pure [illegible] except that [illegible] the seed produced from the Unions. I have recently suggested that the subject of [illegible] by the Land Record staff should be placed before the Agricultural Conference in [illegible] next.

612. *Measures necessary to increase production of long staple cotton in Berar.* In my opinion, measures necessary to increase the production of long staple cotton in Berar are:—

(1) To produce a long staple cotton which will pay the cultivator better [illegible].
(2) To encourage the use of artificial manures.
(3) To extend and perfect our organisation of Agricultural Improvement Societies.
(4) To devise some means in concert with the buyers to ensure that growers get the full value of any new crop.

As regards manure, I would mention that at present artificial manures are practically unused. A few of the more progressive cultivators sometimes use saltpetre as a top dressing in combination with farm-yard manure and I believe in the current season a very few, on the advice of the Agricultural Department, have used cotton cake as a manure. Apart from this, cultivators are almost entirely dependent on the manure of their working cattle, since, with the exception of a small number of buffaloes, these are the only cattle which are decently fed and the greater part of whose manure comes to land. The manure of a pair of bullocks suffices, I believe, to manure reasonably a couple of acres of land. The average area worked by a pair may be put at about sixteen acres. Only a very small part of the land under cultivation in Berar receives all the manure it should get and an enormous area gets practically no manure at all. The effect of manure on the cotton crop is most marked not only in producing a larger crop in a normal year but also in counteracting the effects of bad seasons. If all land under crop were reasonably manured, the outturn of Berar cotton could at once be more than doubled.

ANNEXURE.

Copy of letter from B. P. Standen, Esq., Commissioner, Berar, to the Hon'ble Mr. C. E. Low, C.I.E., I.C.S., Secretary to the Government of India, Department of Commerce and Industry, dated the 8th May, 1916.

The rules of business as distinguished from the statutory authority and the rules regulating the management of the market are contained in the following rules:—

Rule 30 [requires payment of the market fee on every package (*doora*) $\frac{\text{or}}{\text{and}}$ cartload of cotton entering the market]. Rule 50 [permits registration of names of buyers or sellers and requires registration of *adatyas* general commission agent) on payment of a licence fee up to a maximum of Rs. 50 for a buyer or seller and Rs. 100 for an *adatya*. Buyers and sellers only register themselves in order to make themselves eligible as candidates or voters for the Market Committee]. Rule 51 (empowering the market committee to remove the name of a buyer or seller from the registers). Rule 52 (requiring the use of authorized weights and scales). Rules 53—55 (empowering the committee to licence brokers and weighmen on payment of fee and prohibiting

any person in private employ from holding such a licence. It is to be noted that there is nothing to prevent parties from employing unlicensed weighmen or brokers. Rules 26—30 (fix the amount of brokers and weighmen's fees and explain the obligations of buyers and sellers in regard to the payment of the fees). Rules 67—74 (fix the weights to be used and state powers of committee in regard to inspection of weights and punishment for infringement of rules regarding weighment). Rule 76 and section 6 of the Law (prohibit the taking of trade allowances).

Rule 75 empowers market committee to make subsidiary rules with sanction of the Deputy Commissioner. Some committees have not taken advantage of this power. Some, *e.g.*, Yeotmal and Karanja, have framed long rules, others, *e.g.*, Amraoti, have a rule or two only. Of the Yeotmal and Karanja subsidiary rules (which are almost identical) the following may be mentioned to regulate business:—

Rule 1 (prohibits the sale of cotton at any place outside of and within a certain [illegible] of the cotton market yard. This rule is often evaded and few attempts are made to enforce it). *Note.*—Several other of the subsidiary rules are also evaded. Rules 4–6 (require brokers and weighmen to keep accounts. An attempt to enforce this rule in Karanja caused such dissatisfaction amongst the weighmen that the committee cancelled the rule so far as it related to weighmen. In Yeotmal the rule is enforced without objection).

Rule 21 (enforces prompt payments). Rule 23 (requires *adatyas* to keep accounts).

The one subsidiary rule framed by Amraoti empowers the committee to levy a fee of annas one for [illegible] strictly these rules:—

[illegible] a special commission agent (*adatya*) or may seek the [illegible] the assistance he receives in the disposal of his crop are fixed by rule and he should get the advantage of correct weighment. He is also protected from various exactions commonly taken by the gin, where there are no markets, under the name of samples or allowances of one sort or another. The above does not cover nearly all the ground I have covered and I give you below a brief summary of the usual practice:

The cotton carts leave their villages so as to reach the market early in the morning. About 8 A.M. the various *adatyas* and agents receive telegrams from the agencies or principals in Bombay stating the price of cotton in Bombay. This is the Bombay price of the best quality local cotton (Amraoti, Khamgaon or whatever it may be). The cotton market committee then receives an advice of prices and these are put up in the press. But the price of the day is very soon known to all the buyers and *adatyas* as the brokers and through them to the *kunbis*. I never heard of any attempt of combination in a market with the object of keeping the *kunbis* as to the price and I think the existence of many interested buyers would make this impossible. In some markets, *e.g.*, Yeotmal, the buyers agree to and declare the rate of the day in a more or less formal manner. The rate of the day being known, the buyers make their quotations whether to buy or not and if they are buying they either themselves or through the *adatyas* or *dalals* secure the number of *dokras* (bags of cotton) or carts (of unginned cotton) they require. If competition is keen, buyers sometimes offer on a speculative price higher than that warranted by Bombay parity, *e.g.*, the Japanese bought much cotton on these terms this season. A *kunbi* with a cart to spare can always get more than the Bombay rate for *yam* cotton. The ginned cotton is usually put on the market in bales and not *phadas*; its quality is decided at the time the price is fixed as the quality is readily determined. But in the case of unginned cotton, the price offered is understood to be offered on the assumption that the cotton is local cotton of the best quality. The bargain being made, the cart is taken to the gin where the purchaser wishes to get it ginned and the cotton is there weighed (if the purchase has been made through an *adatya* by the *adatya*'s servants, if by the buyer direct or through a *dalal*, by licensed weighmen) ejected out and examined. The buyer may then assert that the cotton is not up to the standard, it may be stained by rain or may contain a large proportion of the later pickings. He then breaks the price down, the *kunbi* is at liberty then to break off the bargain and remove his cotton if he likes. But this rarely happens; by the time this stage in the transaction is reached it is often pretty late in the day and he knows he is not likely to get a good market again till the next day; so he usually accepts the valuation of the buyer (taking the advice of the *adatya* or *dalal*) and takes what he can get. If the bargain has been made through an *adatya* he always settles up with the *kunbi* at once, recovering from the purchaser at his leisure; this is the great advantage of *adatyas*. If the *kunbi* is dealing direct with the buyer or through a *dalal* he may have to wait a day or two for his money.

Now as to "dealings and abuses."

I may say at once that though I have very frequently questioned *kunbis* on the subject, I have never got them to admit that they receive anything but fair treatment except at Basim. Any *kunbi* who knows Basim will tell you that there is a danger of being swindled there and the result is that market has greatly declined.

The commonest complaints of unfair dealing are those made by the big buyers like Ralli, Volkarts, Gaddum, etc., against the *adatyas*. Their charges are—

(*a*) That *adatyas* use their position to secure the best cotton for themselves or their friends.

(*b*) That they swindle the *kunbis* by asserting in collusion with the ostensible buyer that the cotton is of inferior quality, thus securing good cotton at a low price for themselves or their friends; a fall in price in the course of the day sometimes supplies a special motive for this fraud. *Telegrams announcing the fluctuations of price during the course of the day are not as a rule made public property.*

(*c*) That they swindle in weighing: showing less weight. By this means they are enabled to offer an impossibly high price and so to obtain an unfair advantage for themselves or their friends over other buyers who are driven off the market.

Adatyas are always men of some capital, often lending money to *kunbis* and almost always buying on their own account as well as for their principals. The restriction placed on them in this connection is contained in paragraph 7 of the agreement which runs as follows:—

[illegible] name jointly of myself [illegible] and that of another [illegible] ted before 2 P.M. and [illegible] e, in which case I will [illegible] opportunity, stating [illegible] he price or allowance [illegible]

It is obvious that the *aratya* is exposed to considerable temptation to defraud his client and I regret to say that the cotton market committees are admittedly so loath to take action that the *aratya* has little to fear even if he is detected. The fact that *kunbis* do not complain of unfair treatment must be borne in mind; at the same time it must be remembered that a good many of them are very much in the hands of the *aratyas.* This practice of *arat* is certainly a weak point in the markets, but we have the considered opinion of Mr. Rich of Messrs. Ralli Brothers, who had an unrivalled knowledge of the trade, that "*aratyas* have always existed in the Berar markets and the interests of the *kunbis* would undoubtedly suffer, if they (the *aratyas*) were debarred from their calling."

I have for some time past been considering whether any amendment of the rules would improve matters: but think this is very doubtful. It would obviously make things much safer for the *kunbi* if the price could be finally settled in the market; but this is impossible. A fair idea of the value cannot be obtained till a cart-load is opened out: the *kunbi* himself is not above a swindle. The most serious weakness in the market administration is the unwillingness of the committee to take energetic action; the majority of members are either *aratyas* or large buyers, and these men naturally do not wish to offend a class to which they belong or on which they are very closely dependent for a successful season's trade. An influential *aratya* can boycott a buyer who displeases him, even firms like Ralli and Volkarts are subject to this influence: the Agent, Bank of Bengal, who has sometimes been a member of a cotton market committee, is not exempt, as many of the principal *aratyas* do a big *hundi* business. In Yeotmal there are very few *aratyas*, but the *dalals* are very strong and complaint is made of collusion on their part with buyers, by much the same methods as those practised by *aratyas* elsewhere.

A good many carts go direct to the gins without passing through the market; they thus avoid paying the fee, but lose the advantage of the market; under the existing law, sellers cannot be forced to use the market: a proposal is before me to amend the law so as to compel all persons bringing cotton for sale to any place within a specified distance of the market, to pass it through the market. I am doubtful whether such a degree of interference with the liberty of trade would be reasonable also whether it would be practicable to enforce such a rule, since a good deal of cotton that comes into a market town is not brought for sale locally.

The big buyers are so much in the hands of the *aratyas* that they no doubt make the most of any fraud that does go on. The attitude of the *kunbis* towards the markets makes it certain that they are a great advantage to the producers. I am now receiving applications for the establishments of new markets and except that before next season there will be three or four new markets open.

I append copies of the Cotton Market Law and Rules* thereunder and of the Yeotmal subsidiary rules.

ENCLOSURE.

Yeotmal Subsidiary rules.

No person shall expose for sale or cause to be exposed for sale ginned or unginned cotton at any place within the area of the market, *i.e.*, one mile from the centre of the market yard, other than the Yeotmal Cotton Market yard.

2. The cotton carts are allowed to enter the market yard from sunrise to sunset. No carts laden with cotton shall be taken out of the market yard during the market hours until the rate for the day is announced and the bargain is struck.

3. Licenses granted under Rule 53 of the Cotton Market Rules shall, unless suspended or cancelled, be in force from 1st November of the year in which they are granted up to the 31st October of the ensuing year. Licenses granted on any date subsequent to the 1st November shall be in force from the date of issue to the 31st following and no longer.

4. Licenses once granted, and not suspended or cancelled may be renewed from year to year by the Chairman of the Committee subject to the confirmation of such renewal by the Cotton Market Committee.

5. Every licensee shall keep regular and accurate accounts of all his dealings as a broker or weighman in a bound book, which shall be supplied to him at his expense by the Cotton Market Committee, and in the manner prescribed by the Committee. The pages of such book shall be stamped and numbered consecutively in the office of the Committee and the first and last pages of such book shall be signed by the Chairman who shall certify to the number of pages contained in such book.

6. The following procedure should be adopted for filling the account books:—

(A) The weights of carts both loaded and emptied should be entered by the weighman in the book called *takpatti* and a duplicate of it duly signed by him shall be delivered to the sellers. He should take an endorsement in the said book from the buyer showing the number of carts and the weight of cotton purchased by him.

(B) Every broker will enter in his account book the weights of loaded and unloaded carts from the duplicate *takpattis* from sellers, together with the rate and the amount of money paid for their cotton.

7. Every broker shall furnish a weekly report on a printed form on each Monday showing the number of carts and the quantity of cotton purchased by each buyer with the names of weighmen for comparing the register kept under Rule 2 (2) and (3) of the Cotton Market Rules.

8. Every licensed weighman and, when his services are unsought, every broker shall furnish to the Committee a daily report on a printed form prescribed by the Committee. He shall collect the passes granted to the sellers at the time of weighing cotton and deliver them to the Committee with the above report on the next day on which the cotton is weighed for comparison from the collection register.

9. No carts of cotton shall be weighed by any licensee unless the owner or any person in charge of carts has obtained a pass from the Committee's office.

10. The Cotton Market Committee may, for misconduct of or non-compliance by the licensee with the requirements of these Rules or the orders in writing of the said Committee, suspend or cancel his license. The suspension or cancellation under any circumstances shall not entitle the licensee to any refund of fees paid on account of such license nor shall he be entitled to any license in future subject to the orders of the Deputy Commissioner.

11. Every order of the Committee refusing the grant of a license under the rules or cancelling or suspending a license so granted shall be recorded in writing with a brief statement of the reasons for the same. A copy of such order shall be supplied to the person thereby affected, on application by him to the Committee in payment of a fee of five annas for every two hundred words or its fraction.

**Vide* Appendix VI to Report.

14 No licensee shall [illegible] by the Cotton Market Rules

(A) Taking part in a combination to enhance or reduce the prices of cotton or to divert traffic from the cotton market.

(B) Intentional betrayal by a licensee of the interests of any person employing or connivance in any fraud against persons not employing him

(C) *The purchase or sale of cotton on his own account direct or indirect during the period of his license.*

(D) Interference by a licensee between buyers and sellers when his services are unsought.

(E) Demand or receipt by a licensee prohibited under rule 14

[illegible] cotton either on his own account or for any person or firm shall [illegible] or as a regular seller or [illegible]

[illegible] me at Yeotmal but who [illegible] t exceed seven days at [illegible]

[illegible] their *taks* or weighing [illegible] d at the Cotton Market [illegible] be open places [illegible] Rule 60 of the Cotton Market Rules.

21 Every buyer or his servant or agent shall at the time of weighment, enter in his *takpatti* book the names of persons whose cotton he purchases

[illegible] whether remunerated or not shall be held bound [illegible] by the Govern [illegible] 19 [illegible], when possible, [illegible] e to the public [illegible] the Committee [illegible] to Government [illegible] to [illegible] rket [illegible] Rules [illegible] shall be brought for [illegible]

charge up to only rupee one per cent. on ginned or unginned cotton [illegible] sary charges and expenses

29 No *adatya* shall be allowed to engage the *services* of a broker or weighman in any transaction or charge [illegible] the Cotton Market Rules [illegible] him in his work [illegible] s he will be held [illegible]

[illegible] who are convicted

Exception —Persons whose licenses as brokers or weighmen have been [illegible] under the Cotton Market Rules or any other law shall not be allowed to be so engaged

32 The names of servants registered under the above rules shall be removed at *any time by the Com* mittee if they do not act according to the Cotton *Market Law* and Rules framed thereunder *either* by the [illegible]

[illegible] t of all their transactions on the next day on [illegible] number of carts and the *quantity of* cotton or [illegible] may be for maintaining a register in the [illegible] ket Rules

[illegible] en must send *Rs 10 and 2 respectively* with [illegible] cted the amount *deposited* will be returned in [illegible] and the applicants fail to pay the remaining [illegible] to the Cotton Market *Committee*

III.—Burma.

Mr. T. COUPER, I.C.S., Director of Agriculture, Burma.

Examined at Poona, December 12th, 1917.

Written statement.

I.—Agricultural Experience

613. (1) **Experience.**—This note is compiled mostly from office records and Settlement reports I have never been stationed in a cotton-growing tract and have been very little in actual touch with cotton cultivators.

614. (2) **Varieties.**—The short-staple cottons commonly grown in Burma are called *wa-gale* and *wa-gyi*. The former is cultivated in Myingyan, Sagaing, the Lower Chindwin and the west of the Meiktila district. The length of the fibres as reported by the Imperial Institute is "from 0·6 to 1·0 inch; mostly from 0·7 to 0·9 inch." *Wa-gyi* is grown in the Thayetmyo district. The Imperial Institute examination found the length of the fibres to range "from 0·6 to 1·1 inch; mostly from 0·7 to 0·9 inch." The area under *wa-gale* was in 1916-17 approximately 187,000 acres and under *wa-gyi* 26,500 acres. The total area under cotton in the province was 223,500 acres.

615. (3) **Size of holdings.**—Accurate information about average size of holdings is not available. In the *wa-gale* tract, holdings are thought to range from 16 to 25 acres, two-fifths of which are placed under cotton. In the *wa-gyi* area, cotton is not sown as a single crop, but along with sesamum and mostly on a temporary clearing, abandoned after a single year's cultivation.

616. (4) **Yields and profits.**—The average yield of *wa-gale* is 300 lbs. an acre, of *wa-gyi* 150 lbs. The ginning percentage of *wa-gale* is about 35 per cent., of *wa-gyi* about 40 per cent. If in the *wa-gale* tract, he does not get a price of Rs. 20 for 300 lbs., the cultivator begins to bethink himself of other crops. In the *wag-yi* area, the cultivator looks to the sesamum for his profit, and if that fails, he often abandons his cotton, going elsewhere to work as a labourer.

617. (5) **Rotations.**—On a moderate loam in much of the *wa-gale* tract cotton is followed by sesamum and beans or sesamum and millet. On a gravelly soil he fallows his land in the third year and waits till the succeeding year before returning to cotton.

618. (7) **Conditions affecting increase in area.**—If he can grow rice, the Burman will do so in preference to cotton. As regards the upland, millet or sesamum are preferred in some localties, in others cotton according to rain and soil and market.

619. *Attempts to introduce exotic cottons.*—Ginning firms have tried to introduce Cambodia cotton into Burma, but without success. The Agricultural Department is experimenting with it, both as a rain crop and under well irrigation. On a sample submitted to it in 1914, the Imperial Institute reported that the length of the fibres ranged "from 0·9 to 1·3 inch; mostly from 1·0 to 1·2 inch," and that a large proportion of immature fibre was present. Experiments with exotic cottons, American, Egyptian and Indian have failed, but Mr. McKerral is trying to obtain a longer fibre by hybridization. An attempt was made by an English firm to introduce, on a large scale, Egyptian and American Upland cotton into the Amherst district, but without success.

620 *Fluctuations in area under cotton.*—The area under cotton fluctuates with the price. In 1914-15, this fell to Rs. 10 for 360 lbs. and next year, the area fell from 291,000 to 187,000 acres. This is merely an extreme instance of the readiness with which area adapts itself to price. After price, early or late rainfall is probably the most important factor in determining area. Ten years ago, the area under cotton was 204,000 acres and part of the increase in the years preceding the war should perhaps be ascribed to the better recording of areas. There is little in the statistics to justify expectation of any rapid increase. The factors which limit the outturn appear to be price and transport.

621. (8) **Uses of seed and seed selection.**—Seed selection is practised very little, if at all Seed is crushed for oil or exported for this purpose. A few of the more provident cultivators keep back a little seed for hand ginning, but there is difficulty in disposing of the lint and, especially if prices are high, almost everything is sold and the seed repurchased. If a cultivator goes to the ginnery and sees to it that he gets seed from the first picking, he is said usually to obtain fair germination, but if he buys from the heap of seed from various pickings thrown together and heated, he takes risks. Formerly cotton was much watered before sale, but the combine some years ago rigorously refused watered cotton and the quality of the seed improved.

622. (9) **General economic conditions.**—Two large firms have of late years ginned and pressed perhaps four-fifths of the cotton exported from Burma. Of the remaining seventeen presses, only three are of importance at present. The two large firms are believed to have a working arrangement as to the price they will pay and the quantity each will buy. The smaller presses, if sufficiently important are, if possible, induced to enter into the combine or paid not to work. The result is that the cultivator is paid less than his cotton is worth in the world's market. In these circumstances, co-operative credit societies are thinking of erecting co-operative ginneries.

(2) Cotton was originally exported overland to China and the cotton-growing tracts are still on or near the Irrawaddy. So far as soil is concerned, there is thought to be no reason why cotton should not be grown over much of the Yamethin district and in parts of the east of the Meiktila district. But there are no ginneries there and no market; the reason perhaps is that the cotton at present prices whether unginned or baled cannot bear the cost of railway frieght to the river at Myingyan. In the tracts where cotton is already grown for export, the construction of light railways would probably result in extension of area. In parts the quantity of farmyard manure available is the limiting factor; were there sufficient, the necessity for rotation would be less. Increase can be brought about only by improved conservation and better fodder crops, with its consequence, more cattle-breeding.

623. *General recommendations.*—The dry zone of Burma should be the charge of a Deputy Director of Agriculture and he should have an assistant to every two districts, who in turn should have an assistant in each district. The Agricultural Department is under-staffed at present. Seed farms should be established in each district; a very promising strain of *wa gale* with a high ginning percentage has been bred on the experimental farm and is being multiplied for distribution by arrangement with private land-owners.

II — COMMERCIAL ASPECT

outturn

626 (35) Publication of Liverpool and Bombay prices — The daily or weekly publication of Liverpool and Bombay prices might put the cultivator in a stronger position changing him from a weak into a firm holder

Mr T COUPER, I C S, called and examined

627 (*President*) The position is that the systematic study of the cotton problem has hardly been taken

The only inducement would be a

cotton What is especially wanted is a Deputy Director in charge of the dry zone who would have to pay a great deal of attention to cotton A third Deputy Director has been sanctioned and our idea is to cut out the dry zone and make it a separate charge That will be the next step

630 The seed farms are separate from the experimental farms but are very largely in the experimental

and on a plot at Nagy which is near Bugyi in the

a In Pwinbya in

far as I know

the full price The Co operative Department is developing the co operative movement in the cotton tracts

at all We deal with the ginning and pressing returns They are sent to us

the factories It would be very difficult to get them out of the smaller ginning factories I am not in favour of penal legislation for that purpose

634 (*Mr Wadia*) I think that I was told that the price of cotton was Rs 51 for one hundred

That was the latest price I heard Cambodia has not been marketed

in an experimental stage and has not

The cultivators do not take big advances A man may sell a small part of his

before it matures. I believe about twenty per cent of the crop is sold in advance in order to get living expenses during the cultivating season and that sort of thing I cannot say whether the cultivator gets a less price for his article as a result of the existence of this practice The cultivators have to accept the price the brokers offer in consequence of their ignorance of market conditions. The brokers pay the same price to the cultivators

watering the cotton, usin

with the third picking

watered cotton

weights and measures. I have no remedy to suggest There

es and buy from the cultivators direct

their supervision but the cultivators

y are alive to the brokers' methods of

believe in

637. All the ginning and pressing factories are not in the combine. Some of them try to stand out Two very large ginning factories try to get all the smaller men into the ring but occasionally some of the smaller factories stand out. There is one at Mahaling which is standing out. I have heard that the high price of cotton in that neighbourhood this year was attributed to the fact that this small ginning factory had remained outside the combine. This small factory has a 20 H. P. engine with 24 Platts roller gins costing Rs. 15,000, a hydraulic press and a screw press. It is a small factory as compared with the big factories at Myingyan. There is not much hand-ginning. The charge for ginning is about Rs. 7-8 per hundred *viss*, *i.e.*, 360 lbs. of lint. For pressing hydraulically, the charge is Rs. 5 for a bale of 400 lbs. and for pressing in a hand screw press Rs. 3 for 360 lbs.

638. I think the high prices now obtaining should induce an extension of the cotton area in Burma. The acreage answers very readily to prices in Burma. Unfortunately we have nothing better to offer the cultivators immediately than the cottons already grown. As to pushing of Cambodia in the north of Burma, I should say that the Burman prefers to grow rice where he can. We have no experience of growing cotton under irrigation. Cotton is manured with farm-yard manure in parts of the dry zone where it can be obtained.

639. (*Mr. Henderson.*) In the report of the Imperial Institute it was stated that the staple of Burma cotton varied from half an inch to one inch. That is based on two samples of one pound each of *wa-gyi* and *wa-gale*. I think that would be representative of the whole crop. There must be a good many types in that cotton. Mr. Pearse when he was in Burma said that if the long-staple cotton were picked out, it would fetch a premium but the cultivator says he cannot pick it out as the premium that he would get for it is not worth the trouble. There must be a great mixture of types to get such varying lengths of staple.

640. Mr. McKerral is working on cotton. He is distributing one good strain. It has not gone to the mills yet. The Department is buying back what the cultivators are growing and is going to gin it and give the seed back to be grown next year. There is a certain amount of keenness in the villages to get good seed, and if we had good seed to give out, it would be taken up quickly. Proposals for the establishment of new farms have been submitted and are being considered. Proposals have also been submitted for the enlargement of the Department. The proposals are to have eight Deputy Directors in all and an Agricultural Assistant for every two districts. The idea of Government as laid down is to have an Agricultural Assistant in every district ultimately and one Deputy Director to each Commissioner's Division. These proposals were submitted not long ago by my predecessor.

641. The ultimate area under cotton will depend on the price, I think. There is a really good demand and the prospects are encouraging. I do not think that a large extension of the staff and an increase in the number of farms would have much effect if prices were not high. Indications, however, show just now that the prices will be high for a considerable time. A combination of the ginning factories might prevent the world price from reaching Burma. I suppose this combination might be broken by other people and putting up factories. The cotton area is not a compact block but it is not distributed over a very large tract of country. In Thayetmyo there is a large room for expansion but I could not give any estimate of area. The population is very sparse. They work land for some years and then they abandon it. There would be difficulties as regards labour. If there were light railways, the area under cotton could probably be extended. As to the prospects of colonization, I suppose land could be got in the Thayetmyo district for the purpose supposing that the revenue rules were favourable. The Co-operative Department is starting colonization but not specially for cotton.

642. Crop cutting experiments are part of the work of the agricultural staff. This work has just been handed over to the Department. It seems to me that it is part of the work of the Department, so long as there is no separate statistical department.

643. I do not think that there is any chance of the big ginning and pressing firms taking up cotton growing. I do not suppose Government would give them grants of land for the purpose. The object of Government is to have peasant proprietors. The Government would object to exploitation. If a definite proposition were put forward for the grant of land on lease to grow long-staple cotton, there would probably be no objection to it on the part of Government.

644. The Agricultural Department had some long-staple cotton picked and sent to Liverpool and India for valuation. The price quoted was not such as to justify the cost of selection. It is not quite fair to say that cotton is practically a *tabula rosa* in Burma as Mr. McKerral has done a good deal of work on it. We have wanted a botanist for a long time. Mr. McKerral has very many other things to do.

645. (*Mr. Hodgkinson.*) There are possibilities of growing Cambodia on a commercial scale. What strikes me about Cambodia cotton in Burma is that it does not open very well so far as I have seen. The Imperial Institute mentioned that there was a great deal of immature stuff about it. I do not know if that is the result of the bolls not opening well. I have no right to offer any opinion as I have only seen it once or twice. In the first year it was very badly attacked by insects.

646. (*Mr. Roberts.*) The price of cotton in Burma has responded to the general movement of prices. The cultivators told me that the high price this year was due to one of the smaller factories standing out of the ring. I do not know whether this factory was out of the ring last year when prices were also high The publication of Bombay and Liverpool prices might be of use. I do not think that it would do any harm. It would give the cultivators some idea of what they ought to get.

Mr. E. THOMPSTONE, Deputy Director of Agriculture, Northern Circle, Burma.

Examined at Poona, December 12th, 1917.

Written statement.

Note on Cotton in Northern Circle, Burma.

I.—Agricultural Experience.

647. (1) Experience.—The principal cotton-growing districts in this circle are Sagaing (54,800 acres approximately), Lower Chindwin (19,000 acres, approximately), Kyaukse (400 acres). I have have in charge of this circle for over ten years.

648 (2) **Varieties.**—*Gossypium neglectum* is practically the only species grown It occurs (mixed) in two varieties: (*a*) *Gossypium neglectum verum* (yellow flowered), and (*b*) *Gossypium neglectum roseum* (white flowered).

There are two sub varieties of (*a*) *verum, viz.* —

(i) *Burmanicum*, with white lint, called *wa gale* · and
(ii) *Kokatia*, with *khaki* lint, called *wa ni*

This

to ten

re (one
20 to
ice rose
conse-

on the
netimes

experi

er agri-
e above
ly on a
er
lu

I
g
ll
ot

A Note on Shan States Cotton

the Shan States for local consumption only

ons are favour

ied of Cambodia or *Cara-*
mixture, with white
ilar to the ordinary
neglectum

Gossypium

is, the isolation of some of
is part of our scheme to

attempt improvement in this way.

(2) The average *superiority* of the Shan cotton is recognised by buyers and ginners and the latter at Myingyan report that it extends to the ginning percentage as well as to length of staple, though at present

we have no reliable figures to prove this. Shan cotton is being made use of in hybridising experiments at Tatkon; but I am inclined to believe that its superiority over the Burmese is due, in part if not entirely, to the influence of environment. For, though the methods of cultivation employed are no better than those of Burma Proper, the soil on which cotton is grown is generally of a better class and climatic conditions are usually more favourable than on the plains.

659. *Work on Shan States cotton.*—Selection work on local cotton was commenced last year at Yawnghwe Farm in the Southern Shan States and the programme of this farm and of the farm at Hsumhsai in the Northern Shan States include improvement of cotton by selection and better cultivation and also trials of introduced varieties, preferably long-stapled varieties.

Mr. E. Thompstone called and examined.

660. (*President.*) Sagaing and Lower Chindwin are the two principal districts in my circle in which cotton is grown. There is a little in Shwebo. My circle goes down as far as the south of Kyaukse District. A certain amount of cotton is grown in Kyaukse. It is comparatively a small area. The area under cotton in the Sagaing district last year was 54,800 acres approximately. In Lower Chindwin, it was practically 19,000 acres. The two together made up rather more than a third of the total area under cotton in Burma. Practically there is only one kind of cotton grown in my circle, *viz.*, *wa-gale* (*Gossypium neglectum*) of which there are two or three strains. There is the ordinary yellow-flowered variety known as *Gossypium neglectum verum*, sub-variety *Burmanicum*. Another variety *roseum* is found mixed with it. Mr. Gammie calls it sub-variety *arvense*. (The Burmese name for it is *wa-gyu*.) It has a white flower and white lint. We occasionally find another sub-variety of *verum* with a *khaki* coloured lint known as *Kokatia*. Those are practically the only cottons we have got in the Northern Circle but on the borders of the dry zone, we get *wa-gyi* which is *Gossypium obtusifolium*. *Wa-gyi* simply means a big cotton. It is a bigger shrub than the ordinary *wa-gale*. it is yellow-flowered with white lint. It is supposed to be a superior variety but it cannot be grown in the dry zone. It grows as far south as Thayetmyo which is on the borders of the wet and dry zone. The planting season for *wa-gale* begins immediately after the first rain fall about the beginning of June; they go on sowing in July; but do not sow very late. Picking lasts from December to the end of March. The staple is short. It varies considerably, but is seldom more than three-fourths of an inch. It is one of the shortest staple cottons in India. *Wa-gyi* has a slightly longer staple but it is hardly worth considering so far as my circle is concerned.

661. No cotton is grown under irrigation. It has been tried on the Mandalay Farm but the soil of that farm does not suit it. Some better varieties might possibly be grown in the Shwebo district under irrigation. Where the Burman can get water, he will grow paddy. There is, however, some small prospect of growing cotton under well irrigation in Northern Shwebo as the cultivators cannot afford lift irrigation for paddy. In the Monywa district, there are also possibilities for cotton under well irrigation.

662. Most of the cotton from the north of the river goes to Myinmu to the Burma Cotton Company's mills, south of the river, it goes to Myingan. There are two or three buyers there, the Burma Cotton Company and Steel Brothers as well as the local buyers.

663. In my circle, we are devoting more attention than we did to the development of cotton. On the farm at Padu in Sagaing district, we have made some selections from the indigenous cottons and we have some cottons with higher yields and a better ginning percentage. It is a dry farm. There has been no great improvement in the length of lint. If possible, it is our intention to start this year above Shwebo a little Cambodia cotton under well irrigation. I think there are possibilities there for it as a village industry. We have tried experiments on Cambodia in my circle for years and we have not had any success at all. Apart from that we have done practically nothing. Nothing has been done in Mandalay, not even on Pernambuco. I think that there are some prospects of Cambodia under wells and possibly on the lighter soils under the canals of Burma if the cultivator could be induced to give up rice. The bigger money value of the crop would have to be demonstrated. At present we can do very little owing to lack of staff. I do not think that there would be any difficulty in getting better prices for better cotton. The mills have expressed their willingness to give a higher price for long-stapled cotton. The trade is largely in the hands of European firms who are reasonable. There is still village ginning in Burma: weaving is done for local consumption. The cotton is also frequently ginned to obtain seed for sowing. The Department has not organised any method for the distribution of pure and better seed. We are making a beginning near Padu, where cotton is being grown under co-operative societies. We are buying it up this year and ginning it ourselves and going to give back the seed. There are no power gins in the villages. Most of the gins are at Myingyan, there is one gin at Thayetmyo and there is one higher up at Myinmu, which is in the centre of my circle.

664. The possibilities of long-staple cotton are not very great but it is impossible to say anything about them until we have the money and staff to do something with them. Our staff is very limited and is mostly employed in doing crop cutting experiments. We want a district agriculturist in each district. We have four of these men but we want one for each district. The men we have are men from the Land Records Department with six months' training. The crop cutting work occupies nearly all their time; in addition it alienates the cultivators from the Department to some extent because they think it a revenue matter.

665. (*Mr. Wadia.*) There are four districts in which cotton is grown but there are only two in which there is any large quantity. In each of these two districts, the staff consists of one district agriculturist on Rs. 50 and he has only just gone there. My circle consists of ten districts in Burma Proper, and in addition I have all the Shan States, and the Kachin and Chin Hills, in fact all the hill tracts. I have more than one hundred and fifty thousand square miles in my charge. I have only two men on more than a hundred rupees a month; their pay is Rs. 150—250. My staff consists of nothing but the men I have trained myself as best I could on the farms.

666. Cotton is not marketed at all in Rangoon. It is all bought up by brokers and taken direct to the mills. There are no collecting stations. The brokers travel round and buy from the cultivators. They pay cash but sometimes they make advances too. The cotton goes down to Rangoon and much of it is exported to Japan. It is ginned and pressed at Myingyan. There is as yet no power spinning and weaving There is a little hand weaving in Amarapura but that is negligible. There is no guarantee that the cultivator gets a proper price, so far as I know. A certain amount of competition sent the price up this year to Rs. 52 per 100 *viss* (one *viss* = 3·6 lbs.) of *kapas*. Last year it was Rs. 42. The price is regulated by the home market, where there is competition. There was a combination amongst the mills which recently broke

The area expands
about 230,000 acres
e ginners themselves
The ginners are also
cake is exported to
nal Brothers, Finlay,

cultivation is very bad
and they ar taking it up It certainly increases the yield.
but where the cotton area merges on a black soil, wheat is sometimes found as a rotation The land is
useful for rice If the cultivators could grow
after the first rains The picking takes about
arting from about the end of November There
Cambodia could possibly be grown on better
ice, one could never get water there The rain
ne of the other districts higher up it comes from

24 to

in e
for use

We are selecting for yield and ginning percentage but
s, giving a ginning percentage of 34 to 38 That is pretty
ve a gin on the Mandalay farm and have the cotton ginned
There is only an assistant botanist in Burma I am

working on irrigation from
a well I now yet what the
yield is go Mandalay, when
I first wen no success at all,
I would n better conditions
and if we ood results We
want a good cotton farm under irrigation doing good work

to lack of have not tried the
on small
nsuitable f

I have not done any
cbo district There is an opening
cotton is at present
and that is what we are doing
e of the different conditions under
well irrigation according to Madras
areas available in Lower Chindwin
f the canal irrigated areas in this
able for cotton There are no new

circle except Kyaukse are dark clay soils which
projects under consideration which would affect cotton

670 (*Mr Roberts*) We are at the beginning It is practically a blank sheet This
is the first year that we have been able to put o I have
four varieties which are being grown by co opera I propose
Some of
ty The
or three We want two farms for co on We
otton under wells, preferably at Monywa in the

Mr. A. McKERRAL, *Deputy Director of Agriculture, Southern Circle, Burma.*

EXAMINED AT CALCUTTA, MARCH 21ST, 1918.

Written statement.

EXPERIENCE

671 *Indigenou*
the *wa-gyi* area and
acres in 1915 16

(2) The *wa-gale* (early cotton) area is situated in the dry zone of Burma and the principal districts with the area under cotton in each are given below. The figures are for 1916-17 :—

	Acres.
Pakokku	1,770
Magwe	3,251
Shwebo	2,062
Sagaing	54,793
Lower Chindwin	18,998
Meiktila	51,305
Yamethin	1,013
Myingyan	62,097

The principal districts in this tract are accordingly Sagaing, Meiktila and Myingyan.

(3) The plant grown is *G. neglectum var Burmanicum* It is a hardy plant of sympodial habit maturing in about 5 to 5½ months and produces a coarse short-stapled cotton which will only spin up to about 15s and is not more than three-quarters of an inch in length. The lint is white, but not dead white, having a slightly greyish tinge. The ginning outturn at the miles varies from 31 to 33 per cent. There is a variety with reddish or khaki coloured lint which occurs mixed with it. This is regarded as an impurity and a large staff of coolies has to be maintained at the ginneries to pick this out. Other than this *wa-ni* as it is called, there is no real admixture but the crop shows a yellow and white flowered form and there are other morphological characters which show variation on which selection can be based. The cotton is bought up by firms and ginned mainly at Myingyan town but also at Mahlaing in the Meiktila and Myinmu in the Sagaing district. The larger firms such as the Burma Cotton Company, Jamal's Cotton and Produce Company, and Messrs. Moolla Dawood have installed hydraulic presses and the seed is utilized for the production of oil, most of which is exported to Europe. This industry is run in conjunction with groundnut oil pressing, the same machinery sufficing for both.

(4) The *wa-gale* cotton is entirely rain-fed, the rainfall usually being between twenty and thirty inches. The average yield is perhaps about 300 lbs. of seed cotton per acre. There is accordingly no hope of introducing long-stapled exotics in this tract and the lines of progress which have been adopted by the Agricultural Department consist in improving the ginning percentage with a view to increasing the total output of cotton and, as a side line, in endeavouring to improve the staple of the plant in length and fineness by means of suitable crosses. This work will be described later in the note.

(5) The *wa-gyi* (long-lived cotton) area is mainly in the Prome and Thyaetmyo districts but there are small patches scattered over parts of the *neglectum* area as well. The areas for 1916-17 were as follows :—

	Acres.
Prome	1,437
Thayetmyo	25,074

The plant grown here is *G. obtusifolium var nanking.* It differs from the *wa-gale* or *neglectum* plant in being markedly monopodial in its branching habit and accordingly of longer life period. There is no white flowered form. Sown in May or June, it is not picked till February of the next year. There is no doubt that for a coarse cotton this is a very useful plant. The lint is very strong but coarse and short, spinning up to 15s only and having a length of about three-quarters of an inch. It is dead white in colour and has a normal ginning outturn of 39 to 40 per cent. Cultivation takes place along the foot hills of the Yoma and the plant is rarely found growing on level land. It gets a heavier rainfall than *wa-gale* and this probably accounts for the fact that a longer lived type has been chosen for these parts. Generally a second crop is taken which is often considered superior to that of the first year. The market is at Allanmyo where there are ginning factories owned by the same firms as are at Myingyan.

(6) Whether any of the exotic *hirsutum* types would be a success on this area cannot be said at present The area is difficult of access and the Department has only one subordinate in each of the Prome and Thayetmyo districts. Cambodia has been tried last year at the seed farm at Allanmyo but the result could not be called a success. Further trials on actual cultivators' fields are necessary and this requires staff. The area shows considerable fluctuation and a decided tendency to increase when prices are good. It is probable that a very considerable increase of the cotton area could take place in this tract.

672. *Shan States cotton.*—Shan States cotton is the only indigenous cotton which we possess in Burma which can be called fine and long stapled. This plant does not seem to have been described by previous writers on the Indian cotton. It much resembles in habit and life period the *wa-gale* or *neglectum* type and exists in two forms, a yellow and a white flowered. The foliage however show marked reddish coloration and the plant is on the whole less robust than *wa-gale*. The lint is up to 1·2 inches in length and is fine and silky but scanty, the ginning outturn in unselected samples being only 25 per cent. Messrs. Tata and Sons, Bombay, examined this cotton for me some time ago and stated in their report that it could spin from 28s to 32s warp and 32s to 36s weft. It seems to be grown to some extent all over the Shan country as samples have been received at the experimental farm at Tatkon from both the Northern and Southern States. These lie outside the circle of the present writer and he cannot say anything of the conditions under which the crop is grown. The Superintendent, Southern Shan States, however, has supplied the following information :—

"Speaking generally, cotton is a minor crop in the Southern Shan States. The greater part of the outturn is utilized locally. West of the Salween, Burma is the natural market for such cotton as is available for export, though Chinese caravans returning to Yunnan occasionally load up with it. The export from the trans-Salween State of Kengtung is invariably to China.

(2) Figures for the area under cotton and the yield per acre are not available. I believe the average yield is less than that of the cotton-producing districts of Burma : but whether this is due to natural causes, or to want of care in cultivation I cannot say.

(3) There are large tracts of waste land in the Southern Shan States and if some of these tracts, near the railway, are suitable for cotton, there is no reason why the cultivation should not be largely extended. I take it we want expert advice as to the suitability of soil and climate, and an assurance that the cotton produced could be sold profitably, before any appreciably development can be looked for. Some years ago buyers came to Taunggyi from Myingyan, and (if I remember rightly) paid up to Rs. 30 per 100 *viss* for cotton. They got a certain quantity within a radius of fifty to sixty miles of Taunggyi, and the demand led to increased production. The demand ceased, and people who had cultivated or collected cotton to meet it lost money. In my opinion little or no cotton is now grown in the States near the railway except for local

use. The retail price is about Re 1 for five tiss There is little doubt that an assured demand, at a profitable price, would stimulate production amongst the people who grow cotton at present But expert advice is required before urging cultivation on a large scale "

673 *Exotic cottons* —During the last five years, the Department has made trials with Cambodia, *buri*,

of the enterprise

674 *The improvement of Burma cotton* —In 1914, a farm of forty acres was opened at Tatkon in the Yamethin district which had as its principal object the improvement of indigenous cotton and trials of exotics. In that year a collection of the indigenous cottons

As a result of one year's observations, it was seen that the

selection for this character was likely to lead to satisfactory

lint Many strains were isolated and propagated pure the

selections were made, *viz*, (1) a white flowered strain of *wa gale* (*neglectum* type) showing a ginning outturn of 40 per cent as against 33 per cent in the unselected crop and (2) a strain of *wa gyi* (*obtusifolium* type) showing an outturn of 45 per cent as against a normal outturn of 39 per cent Of these (1) is now ready for distribution to cultivators and it is expected that seed for 300 acres will be available next year. The selected strain of *wa gyi* will, it is hoped, be cultivated on a field scale next year It is estimated that the substitution of these strains for the present stock will increase the annual value of the raw cotton produced in Burma by at least six lakhs of rupees, in normal times and more than double that figure should present rates continue, and as there is a constant demand for this short stapled cotton from Japan, India and Europe it is probable that the best policy at present will be to organise the distribution of seed of these selected strains Being derived from single plant, the product will also be more uniform and the strains are also free from the *wa ni* impurity mentioned above The increased value due to the absence of *wa ni* cannot be expressed in terms of cash, but will be considerable

(2) In view, however, of the certainty of Burma desiring to have its own spinning industry at a very early date attention has also been given at Tatkon to the improvement of the quality of the staple of the indigenous cottons In all three crosses have been effected, *viz* —

(1) *Wa gale* × Shan.

(2) *Wa gyi* × Broach

(3) *Wa gale* × *wa gyi*.

grown and a large number of single plants selected Some of these gave promising lint the staple being longer and much silkier than the *wa gale* while not so scanty as that of the Shan In the case of the Broach × *wa-gyi* cross, it is too early to speak as yet About four acres of the F2 generation are at present being examined but the trees were not in bearing at the time of writing

(5) These crosses, even if successful, will take a considerable time to fix and in the meantime it would

owing

nown

for in

f high

enous

asing

, the

tirist

n his

is can

be efficiently supervised

(3) The possibilities of the Shan States both

at present grown and with reference to trials with

at present of conditions there and an Agricultural

I understand that during the present year the big

ent of cultivators in the dry zone A pioneer ginnery

would ensure a supply of pure seed of Shan cotton

would probably be the best way of developing the industry on sound lines The advent of the railway makes the present time particularly suitable for taking some action of this kind

(4) Attempts to introduce exotics of the *hirsutum* type do not appear to have been conducted in India on as scientific lines as they might have been The usual method attempted seems to have been to introduce directly varieties which have had a reputation in America or elsewhere The very fact, however of a variety

being one of repute in America shows that it has been chosen with reference to American conditions which are very different from those prevailing in India. Recent work, indeed, in certain provinces of India would seem to show that these types can be improved to a certain extent by intravarietal selection The most direct and also the most scientific method would therefore seem to be to import a certain number of these exotic varieties and then proceed to cross them *inter se* with a view to selection in the second generation of new types to more suitable to the conditions of the locality in which it is intended to grow the cotton. This kind of work does not seem to have been attempted in India or if it has, no results have as yet been published. It would of course entail space, time, and the services of whole time plant breeders to undertake it but it would seem to be well worthy of trial.

(5) The question of pure seed supply is in Burma, as in other provinces of India, of great importance. Last year apparently some of the mills in Meiktila district, which ordinarily gin the short lived *wa-gale* type stimulated by the high prices being paid, began to purchase *wa-gyi*, the long-lived cotton. The seed of the latter is reported to have been sold to cultivators in the *wa-gale* tract who, unable to distinguish it from *wa-gale*, planted it out and found to their surprise and chagrin that they got scarcely any crop at all this year. Shan seed is also reported to have been distributed in the same tract. The quality of the seed given out by the large ginneries is beside often of very bad quality. Ten pounds of seed if good should suffice to sow an acre but cultivators often broadcast as much as thirty pound. In some cases, the *kapas* has to be carted 25 or 30 miles to the gin and the cultivator, unable to obtain seed at the time he sells his cotton, has to make a second long journey in March or April for this purpose. The only apparent solution of these difficulties would be to have small ginneries mainly for seed production erected in the middle of each important tract. Thus, in Burma, ginneries to deal with say 1,000 or 1,500 acres in the Meiktila, Sagaing, Myingyan, Thayetmyo and Prome districts, carefully supervised by the Agricultural Department, would serve as centres of pure seed for whatever strain of cotton it might be advisable to distribute. These could either be erected by co-operative credit societies themselves with help from Government or could be entirely under the control of the latter. At all times, provided the necessary mechanical skill were forthcoming, it would pay a society to gin its own cotton but it is highly improbable that in the present state of mechanical efficiency in Burma this line of development will be possible on a large scale. A few such ginneries are however extremely necessary from the point of view of the production and distribution of pure seed.

(6) For the reasons given above, *viz.*, the danger of haphazard distribution of mixed seed by ginneries, I would favour the compulsory registration and licensing of all ginneries. This would make ginners more careful in the matter of seed distribution.

Mr. A. McKerral called and examined.

676. (*President.*) I do not think *wa-gale* is a long staple cotton. It is generally three fourths of an inch. That is the maximum staple. It varies from half to three quarters of an inch. Selection work is being done on *wa-gale*: we have got one selection which gives the high ginning percentage of forty per cent. as opposed to 31 to 33 per cent. for the ordinary crop. The length of the staple is just the same. Selection is being done for ginning percentage only. *Wa-gale* is spread over the principal cotton districts of Upper Burma.

677. As to attempts to introduce exotics in the principal cotton districts of Burma, I have had trials made with Cambodia but I came to the conclusion that it was not likely to prove a success; in the ordinary cotton tracts it did not do at all. Most of the cotton is grown on red soils in districts such as Sagaing, Meiktila and Lower Chindwin. It is grown on the highest soils. They are the very worst soils for other crops but probably the best soil for cotton. They consist of a sort of gravel. We have not had very much experience with Cambodia. We had it growing in the Yamethin district; in the first year it gave a promising yield —about 1,200 lbs. to the acre—but since then it has not been doing well. This year I got the Assistant Entomologist to examine the crop. He found that 75 per cent. of the bolls were attacked by boll worms. Well irrigation is not extending very much in Burma.

678. The bulk of the Burma crop is *wa-gale* and the remainder *wa-gyi*. The latter is grown in the two districts of Thayetmyo and Prome. The area in Prome is about a thousand acres The whole area amounts to from 26,000 to 28,000 acres. It has been up to 30,000 acres. It varies every year. The staple of *wa-gyi* is much the same as that of *wa-gale*, *i.e.*, three-fourths of an inch but it has a better colour and a much higher ginning percentage and therefore fetches a higher price. I think the premium is Rs. 5 per hundred *viss* of seed cotton. There was some admixture of the two in the fields last year. This year, people in Myingyan started buying *wa-gyi* seed on account of the high prices of cotton. The plants did not produce any thing and the crop was a failure.

679. Cotton in the Shan States is at present negligible. We do not know what the area is. I believe there are about 2,000 acres in the northern Shan States. This year people have started buying there. It is good cotton and Messrs. Tata's report on it is that it is equal to Surat. It is very fine cotton, staple up to an inch or more and spinning from 28 to 32s warp and from 32 to 36s weft. It has got a very low ginning percentage. It is not the only cotton in the Shan States. Some one has lately been spreading some type of American cotton in this tract, probably Cambodia. The Shan States are practically untouched by the Agricultural Department but an experimental farm has now been started at Yawnghwe in the Southern Shan States. They are not under my charge, but under that of Mr. Thompstone. I cannot say anything therefore about the possibilities of extension in the Shan States. The population is limited. Much depends on prices. If people were there to buy, there might be considerable extension.

680 We have been selecting *wa gale* for ginning percentage and are aiming at an improvement of quality by crossing *wa-gale* with Shan and *wa-gyi* with Broach. I cannot say very much about this because the crosses are only in the second generation but some of the plants are very promising.

681. We are suffering very much from shortage of staff, both superior and subordinate. I think we want seven Deputy Directors altogether, *i.e.*, five more. I cannot say whether in the redistribution we should have a cotton tract and a rice tract. I think it would be a very good thing for the Deputy Director working on cotton in Burma to make an extensive tour in the cotton tracts in India. With regard to staff, I have mentioned in my written evidence that demonstration at present is practically impossible because we have got to do the crop reporting of the district. The district staff consists of a single man in each of a few districts During part of the year, their whole time is taken up by crop measurement work in the district. In the cotton districts, one man has got about thirteen crops to do in five different parts of the district. I consider that a very serious handicap to my work Things are not so bad in other parts of Burma. The crop cutting is a serious hindrance to demonstration work We have of course, protested but nothing has been done I have had no experience of tree cottons.

y b g *firms* su h as Steel Brothers and tl e Purma
e gins a o the ordmary single roll r McCarthy
There cannot be much mix ng as Purma has only
I do not think t a *gale* and *wa a,a are mixed*
I Sl n St te cotton There s ot muc adult
damp ng Damp g is do e by tl o cult vator
md to conta n damp cotton and that attempts are
made to get over the difficulty in that way

684 I have advocated in my wr tten evidence the estal lishment of small *ginner es in the* m ddle of each

... s wo ld m ke g nne es more careful in the matter
dea entirely underlying
uld be taken away if
ne I have not thought
much about I think a licensing committee i each province is all that is required I would prefer a comm ttee for each province instead of a central bureau for the whole of Ind a

685 (*Mr Hodgkinson*) I think the area capable of gro ving cotton could be very considerably increased —more especially in the Shan States and probably also in Northern Burma I do not kno v Northern Burma myself Shwebo and Katha are very similar in climatic and soil condit ons to Thayetmyo district where

... more or less co tated that t ...
staple cotton at present and we are increasing the area under short staple because that is all that it is poss ble
... here

... s b en tried in ...
cotton The rain fall at Yamethin is sim lar to tl at in t ... n be grown and be ns can be

can types ...
rs stently for some years They
No systemat c experiments have
ry wh ch is comparat vely thinly
populated

688 As to our methods of working we go for selection and crossing I am *fairly* sure that we have got all the types growing in Burma isolated I have examined *wa gyi* very carefully in the fields from plant to plant and so far as staple is concerned there is little to select I do not think we get a big mixture in our

fields ; we have a yellow flowered variety and a white flowered variety and there is a certain amount of variation in the leaf. There is no difference in staple between the white and the yellow and the ginning percentage is the same. We have two kinds of flowers in the case of *wa-gale*. They are yellow and white. In the case of *wa-gyi*, I have never seen a white flower. We can select within the white and within the yellow for ginning percentage. We have selected the white flower simply as a form of *wa-gale* cotton. It is more easy to find out whether the plants are pure or not. Our white flowered plants are not like the Central Provinces white flowered *roseum*. I have had Central Provinces *roseum* growing side by side with it. It is possible, according to Mr. Gammie, that white flowered *indicums* have a much higher ginning percentage than the yellow flowered ones. I do not think there is much more to be done in the matter of selection here. There is a considerable amount of variation in the staple in the field, due partly to difference in types and partly to difference in cultivation. There is some scope for finding which is the most profitable. It would be a step if we could get the staple uniform.

689. As to staff, I have got one assistant who has been trained by myself more or less for crossing work. During the last two years, we have had two others under training but they are not yet fully trained. They have been taught how to do crossing work. They made a great many crosses in which, of course, there were a great number of failures. It is complicated work for which I shall want a bigger staff next year. We have got seed of the higher ginning percentage type of the *wa-gale* last year for about 300 acres. I have not done any yield test. The cultivators are very pleased with it and they maintain that it is a better yielder than the ordinary variety.

690. (*President.*) The present price of Burma cotton is Rs. 75 for 360 lbs. of *kapas*. The ginning percentage is 31 to 33. The average ordinary price is Rs. 20 to Rs. 25. This has been the average price for the last five or six years. This is the price in the districts. The average ginning percentage of *wa-gyi* is 39 The price of Shan cotton so far as I know is just the same as the others. No higher price is paid for the better staple. It is difficult to get it pure; it is simply mixed with the others. We are aiming at uniformity and to get pure types out. That is the idea. The idea is to get the high ginning percentage variety out, give it to the co-operative unions and to get back the seed. I am afraid that I have not given much thought to the question of posting Bombay prices in Burma. Mr. Gammie sent one of his assistants to Burma; he took away one of our crosses and Mr. Gammie thought that it was very promising.

691. I have not heard of any cases in which large grants of land for special purposes have been given in Burma. I think it would be very difficult to get a grant of land in Burma, except perhaps in the Shan States where there is a lot of waste land available.

IV.—North-West Frontier Province.

Mr. W. ROBERTSON BROWN, Agricultural Officer, North-West Frontier Province.

Examined at Poona, November 12th, 1917

Written statement.

I.—Agricultural Experience.

(*a*) "*Deshi*" *short-staple cotton.*

692. (1) **Experience.**—I have been stationed in Lahore for five years and in Peshawar for seven years. I have been in the cultivators' fields, during the greater part of the past seven years.

693. (2) **Varieties.**—*G. neglectum*, is the only variety grown.

694. (3) **Size of holdings.**—The average size of holdings is about ten acres ; the holdings are usually the property of families, and one-third of the land may be under cotton where the crop is most successful.

695 (4) **Yields and profits.**—The average yield is ten maunds of 82 lbs. per acre. The average profit Rs. 30 to Rs. 35 per acre, *i.e.*,

	Rs.
Cost of cultivation 1 picking, marketing	40
Ten maunds of *kapasat* Rs. 8 per maund	80

696. (5) **Rotations and manures.**—The usual rotation is cotton, wheat, maize, clover or cotton, barley, maize, when clover can not be grown owing to scarcity of water. Cotton is never manured : the crop already is inclined to grow too tall and to leaf.

697. (6) **Comparative returns.**—One cotton only is grown. It is a high yielding, medium long, silky cotton of good quality with poor lint percentage, which, usually, is not better than 25 to 26 per cent.

698. (7) **Conditions affecting increase in area.**—The area under cotton, where the crop is at its best, fluctuates little, and fluctuations depend on the abundance or scarcity of water in the river Bara. In certain parts, the area depends on the price of cotton. The area may be expected to increase very considerably as land on the Upper and Lower Swat Canals becomes populated.

(2) American cotton does very well in Dera Ismail Khan, where the climatic conditions resemble those of Sind, but this district is not yet irrigated. The limiting factor in the extension of cotton cultivation is perhaps chiefly lack of population on the Upper and Lower Swat Canals.

699. (8) **Uses of seed and seed selection.**—Cotton seed is used to some extent by the military dairies, and by private dairy men, but most of the cotton seed is exported. In the best cotton tract, indeed in the one and only cotton area, the seed for sowing is carefully selected and specially hand ginned.

700. (*General.*)—On the newly irrigated land where the population is yet scanty, cotton will find increasing favour because it may be grown with little tillage and without much intercultivation. On the more intensively cultivated land, cotton cannot compete with maize, which is a staple food in the North-West Frontier Province. Maize yields as much money, generally, per acre in ninety days as cotton gives in 290 days, and further, wheat suitably follows maize in the autumn. Cotton, on the other hand, is sometimes on the land till late November and even till mid-December, when it is very late for wheat sowing. Cotton is more exhausting than maize on Peshawar land.

701 *Experimental work on cotton at Peshawar*—All the more noted *deshi* and American [illegible]

Mr W Robertson Brown called and examined

702 (*President*) The extent of cotton cultivation in the North West Frontier Province is fully fifty [illegible]

North West Frontier Province [illegible]

704 [illegible]

It is dam [illegible]

cotton. [illegible]

[illegible] It averages ten [illegible] North West Frontier Province [illegible] he remedy lay with the ginners

707 There is no proposal to establish a [illegible] The Peshawar Agricultural Station is 200 acres in extent

V.—Punjab.

Mr W C RENOUF, I C S, Political Agent, Bahawalpur Agency.

Examined at Lahore, January 8th 1918

Written statement

708 (1) Experience—I fear that I am not in a position to express an opinion that can have much value on the subject of American cotton, for my connexion with the matter was severed in March 1911, when

I handed over charge of the Punjab Department of Agriculture. The next four years of my service in India were in Rawalpindi where practically no cotton can be grown. I now hold the post of Political Agent, Bahawalpur, Malerkotla and Faridkot, and the only point I can discuss usefully is the prospects of American cotton in the Bahawalpur State.

709. *History of introduction of American cotton into the Punjab.*—I venture to offer a few preliminary remarks on my early connection with American cotton, although these have merely a historical interest. I think I may say that, prior to 1911, I was identified with the endeavour to introduce American cotton more closely than anyone else in India. On taking over charge of the Department of Agriculture in March 1913, I found that a small trial had been made at Hissar in 1902 under the advice of Mr. Mollison, Inspector General of Agriculture in India. This was adjudged very promising. I was directed by the then Financial Commissioner, the late Sir Lewis Tupper, to devote special attention to the improvement of cotton and I made this my first care, submitting, after such enquiry as was possible, a special preliminary report to Sir Lewis Tupper. There were no agricultural specialists in the Punjab in those days, and the Director had to do the best he could with a couple of very imperfectly trained and newly appointed Indian assistants. The expert advice available was that of Mr. Mollison. Agricultural specialists began to be appointed from England for the Punjab in 1905 and 1906. Mr. Dobbs took over the important botanical work in the autumn of 1906 and Mr. Milne in 1907. Outside trials and propaganda remained with me for a little time longer. The Hissar plots were abandoned in 1903, and the experiment was continued at Lyallpur. A few selected colonists at Lyallpur were persuaded to give a trial to various varieties of American cotton in 1904, and, at the same time, endeavours were made to secure a fair price for the better staple. The experiment was extended to Sargodha in 1905, and, here also, American cotton did well. Trials were made in Hissar, Patiala, and in one or two other places. The trial at Hissar was in the garden and in the care of the present Director of Agriculture in the Punjab.

(2) I am not in a position to trace the history of the experiment in detail, for I am writing entirely from memory. If the matter is of interest, I would refer to the annual reports of the Punjab Department of Agriculture from 1903 to 1911, in which I made a very careful annual summary. By 1911, the area had expanded to, I think, some thousands of acres, and I felt that the outlook was very hopeful indeed. I was of the opinion that what was first needed was a slightly improved staple, and, here, the experiments of Mr. Milne, the Economic Botanist, were full of promise. I also hoped that a slightly higher premium might be forthcoming for American cotton as the market price developed, and as the staple improved. I believed that very little would turn the scale and establish American cotton over a very wide area. The premia now realised are far beyond my most sanguine expectations.

(3) I should mention that although cultivation had expanded, it was not easy to say with certainty what the exact reason for this was. The issue was fogged by the fact that we at first thought a little extra water was needed for the cultivation of American cotton and the Irrigation Department accordingly undertook to endeavour to supply this extra water. Many men undoubtedly grew American cotton merely as a means to obtain extra water for their other crops.

(4) Our greatest difficulty was to secure what we thought might be a fair price for the small quantity of American cotton placed on the market. It was a most disheartening task, as is usually the case at first with a new product. At one time, one or some of my specialists were strongly in favour of scrapping the experiment, being impressed by the reluctance of buyers to come forward and by the doubt as to whether the expansion in the area under American cotton was to be ascribed to the desire for the extra irrigation occasionally made available. I think I may claim that it was I who averted this calamity. I had a strong belief that American cotton was suited to the climate. In the course of my tours I had seen pure cultivated in small plots in many parts of the Province, this being the offspring of American cotton introduced at haphazard by Government some thirty years before. I was struck by its persistence. I felt that it should be possible to effect at least a small improvement in the staple as well as to develop the market, and that the ground gained should be held. Estimates of comparative profit on American cotton seemed to me to indicate that very little would turn the scale.

710 *Experiments with other exotic cotton.*—Egyptian cotton received an extended trial at the same time as American, but it was soon clear that it needs a very much milder cold weather in which to yield a satisfactory outturn. Tree culture also failed completely.

711. *Prospects of American cotton in Bahawalpur.*—I now proceed to the discussion of cotton in the States of the Agency in my charge. Bahawalpur has a culturable area of 899,331 acres. The area sown with cotton is, however, only 13,112 acres. The smallness of the cotton area is entirely due to the prevailing agricultural conditions. The total annual rainfall is about five inches, so that irrigation is indispensible. Irrigation is, at present, almost entirely by means of inundation canals which run very capriciously. They generally start when May is well advanced and they are liable to stop in September. The population is sparse and the heat is phenomenal and inimical to all effort in certain months The result is that all the features of extensive cultivation are in evidence in a marked degree. Ploughings are few, and weedings are rare. By far the largest area is sown for the spring harvest on the heavy moisture left by canal floodings. With showers at Christmas, there is a fair or a good crop. If these fail, the outturn is very poor. Canal irrigation is supplemented by wells and the number of these is increasing steadily if slowly. These now number 19,748. There are three tube wells, two of which are successful. The failure of the third is ascribed to the neglect of the owners. Where there are wells, the standard of cultivation improves. In some tracts, particularly in the north-east, colonists, who are careful cultivators, have come in and these have made their influence felt to some extent.

(2) The *deshi* cotton sown is all of the ordinary short staple and calls for no remark. There are three ginning mills.

(3) A few colonists have sown small patches of American cotton, but generally they have kept the produce for their own use. As regards the suitability of American cotton to the soil and climate, I cannot do better than quote the opinion kindly furnished by the Hon'ble Khan Bahadur Sayyed Mehdi Shah, who owns land in the State. He was one of the pioneers in the Lyallpur tract in 1904, and he has made trials in Bahawalpur. He is a very reliable and experienced observer. He considers that American cotton will do as well in Bahawalpur as in Lyallpur, if not better, provided, of course, that it receives proper attention. And he opines that sowings can be somewhat later in Bahawalpur. I enclose a copy of his letter dated the 11th December 1917.

resent highly profitable rates which will
what will take place with dependable

112 *Prospects of co ... Malerkotla and Faridkot* —In Malerkotla with an area of 101 539 acres only 1 200 acres are under cotton while the cotton area in Faridkot total area 4 471 530 ghumaons is only 512 ghumaons Neither of these States is a cotton tract and looking at the adjoining districts there seems to be no likelihood of their becoming so

ANNEXURE

Letter dated the 11th December 1917, from the Hon ble Khan Bahadur Sayyed Mehdi Shah Gojra District Lyallpur to the Political Agent Bahawalpur Agency

I am in receipt of your kind favour dated Bahawalpur the 6th December 1917 and thank you very much for the same

It is no doubt a fact that American cotton has become exceedingly popular here and the soil of the Chenab Colony and its climate have come to be regarded as most suitable for its cultivation But I have got some land both in the Bahawalpur State and in the Chenab Colony and can institute a comparison Therefore on the ground of my own personal experience I can safely say that the soil of the Bahalwalpur State and its climate are as good for the cotton crop as that of Lyallpur if not better

Committee and am writing it for the purpose and as question 56 clause (*a*) (*b*) (*c*) and (*d*) have a special reference to the Bahawalpur State conditions therefore I shall try to discuss them

Mr W C RENOUF, I C S called and examined

713 (*President*) I have been very pleased indeed to see the way American cotton has flourished There

three years we went on with the same Dharwar American from our own selected seed In 1907 we found that

hope that private enterprise will come in and take them over. The quantity of American cotton is getting large enough for that now.

715. The success of American cotton in the Bahawalpur State is entirely contingent on the irrigation scheme in the development of which there is unfortunately a serious hitch. The claim of Bikanir to have share in the water which the canal will bring is very hotly contested by Bahawalpur. The dispute has gone on for many years and we are apparently no nearer a solution than we were at the beginning. The present position is that the Government of India are examining the claims of the Bahawalpur Durbar to the exclusive right to the water. I think the prospects of the tract for American cotton are very promising, provided irrigation is forthcoming. The Hon'ble Mr. Medhi Shah has already successfully cultivated American cotton at Rahim Yar Khan, slightly to the south of Khanpur, where he has a large farm. He is very enthusiastic. He has a tube well there so that he has a sufficient supply of water. He had, this year, thirty acres under American cotton and his outturn was from five to thirteen maunds an acre. The larger outturns were from ground which was properly prepared and the smaller ones were due to bad cultivation. The soil was virgin soil. Mr. Mehdi Shah's opinion is that that tract is more suitable to American cotton than Lyallpur. The heavy rainfall in September did not affect the flowerings as much as in Lyallpur, and he will get another picking this month (January) which will not be the case at Lyallpur. This absolutely confirms the theory that I have put forward in my written evidence. Mr. Mehdi Shah thinks the quality of the Bahawalpur cotton is somewhat better than that at Lyallpur. He brought the seed from Lyallpur, as well as cultivators. If the irrigation problem is settled, Bahawalpur seems a very hopeful tract, but until you have irrigation there you won't get people to go there and cultivate. Once you get irrigation, the odds are that American cotton will be grown to the exclusion of any other cotton.

716. There is no agricultural staff in Bahawalpur.* There is nothing there at present which could come under the Agricultural Department of the Punjab. A start ought to be made and probably will be made. The Punjab Agricultural Department has nothing to do with the State, but its advice and assistance would be welcomed.

717. (*Mr. Roberts.*) The total area under American cotton in the Punjab in 1910, was large, possibly 10,000 acres. The area sown with seed from the Department was actually only a little over a thousand acres. But there were quite a lot of people who were growing American cotton without the cognisance of the Department. We learnt this as we saw the cotton coming in afterwards to the auctions. There was a good deal of it in Jhang and it was very hard to get an estimate of it. As to the arrangement for marketing in the early days, in 1905, Messrs. Mela Ram and Sons of Lahore bought 724 maunds, almost the whole of the produce, at a premium of Re. 1-8 by arrangement. In that year all the cotton was brought into Lahore. In 1906, Messrs. Mela Ram again bought at Re. 1-6 premium but they arranged to buy on the spot. There were, however, very many complaints that their agent was not always there and that people were kept waiting and so on. The cultivator could not wait at their agency indefinitely with his cotton. A man named Sadiq Mal paid about Rs. 1-7 or Rs. 1-8 premium and bought quite a lot of cotton that year. In 1907, Messrs. Mela Ram bought again and there were the same unsatisfactory features in the arrangements. However, Messrs. Mela Ram, on the whole, gave us valuable help at a critical time, when no one else came forward. In 1908, we were tired of this and we went in for sales by auction. It was a daring step, of course, but the auction was really a success, although it gave no end of trouble. There was a rough classification and many bad sorts were rejected.

718. My observations while on tour before 1904-05 were that American cotton was found absolutely pure in small plots in some of the old districts such as Hoshiarpur and Jullundur where it was called "*narma*". It was unknown in the market. Seed of this Punjab *narma* was obtained in 1902, when somebody collected a few handfuls. We discarded Punjab *narma* at an early stage as it was very inferior compared with Dharwar. Work with American cotton was started at Hissar, but, after a year, was transferred to Lyallpur at Mr. Milne's suggestion, in 1902.

719. (*Mr. Henderson.*) I should say that the conditions in Bahawalpur are very similar to those in northern Sind. The cultivation in Bahawalpur is absolutely the worst I have ever seen. I do not blame the cultivators in any way. They have no incentive to do better. They own large areas and both canal and rain water are very precarious. They take the chance of there being a crop and if there is no crop, they live very largely on the produce of their date palms and on their herds of milch cattle which find good grazing in extensive waste tracts. There is no certainty as to when the canals will begin running. This year, they did not begin till the 15th or 20th May. There is no water for the preliminary preparation of the soil for cotton cultivation: this is the difficulty as regards sowing cotton in May. When the river rises, the canal water comes down the channels. The irrigation system is still somewhat primitive, but it is being improved methodically. Water is very rarely available before the 20th of May. My experience of the canals in Multan and Bahawalpur is that they are tending to start later and later as time goes on, with extensions of canal irrigation in the Northern Punjab. Some twenty years back, they used to start earlier than now. The canals are fairly large. The whole place is a net work of them. There is lift irrigation at the head and rice is grown towards the tail. The old system was as to put a big *band* at the head and flood the water all round. When the people served by this *band* had taken all the water they wanted, they cut the *band* and let the water go down to the tail. This system is being stopped. It means silting at the head of the canal.

720. Bahawalpur is thinly populated at present. I do not think that Marwaris could be got for picking. Pathans come in to do earth work in the winter but not in large numbers. A certain number of people also come from Bikanir but not very many. The labour difficulty will probably not be as serious as in Northern Sind. It is rather difficult to get tenants now from the Punjab. There are three ginning factories in Bahawalpur. There is not much cotton grown there. The population of the State is about 750,000. On the whole it is rather sparse. That is excluding the desert area which does not maintain anything. The desert or waste area is enormous.

721. (*Mr. Wadia.*) The difficulty in marketing that I mentioned was due to the small quantity of cotton. It was inevitable in the case of a new product. The crop was only about five to nine thousand maunds of unginned cotton, *i.e.*, about 250 bales of lint. It did not pay any big firm to come down and purchase it. I do not remember for what purpose Mela Ram bought the cotton, but my impression is that he used it for spinning. Prior to 1904, a few cultivators were growing Punjab *narma* in small patches. They did not market it at all. In a whole district, you would not find more than a dozen patches which caught your eye at once

* The Durbar has since taken steps to establish an agricultural station at Bahawalpur.

while riding. *Narma* was used *for private consumption* The cultivator's wife worked it up for him into a special garment *This is still done in Bahawalpur.*

sion is that it was all

ome people to grow

This mixing was,

stopped, I should say

suitable deductions.

brings in his lot of cotton, the only course is for the purchaser to look at it and, if, for example there is twenty per cent. of short staple cotton in it, to cut the price rather more than twenty per cent. Next time it would be to the cultivator's advantage to grow or market it pure Buyers certainly ought to be able to form a rough idea of the percentage of admixture by taking a few handfuls of the cotton and looking at it Unless some action of this kind is taken, people will go on mixing I think the prevention of mixing is purely a business matter The agents must be on the look out for it and penalise people so as to make it not worth their while to mix. This is the only course, I can think of As the premium increases, the tendency will be to mix

o not think

I cannot

There were

ling of the American cotton and only dealt with *deshi* cotton.

723 (*Mr. Hodgkinson*) My experiments with Egyptian cotton were a complete failure. The plants grew beautifully but the outturn was insignificant. A very little cold seems to have affected them

724 (*Mr Roberts*) At the first auction sales, I think the local factory owners bought most of the cotton and they were the best buyers up to the fourth year. Messrs Rali Brothers bought some Messrs. Rallis and Volkarts helped to organise the sales and made useful bids, but the factory owners secured most of the cotton.

725 We expect about 2,000,000 acres of irrigation if the Bahawalpur canal is sanctioned It is a fertile tract and with the present high premia on American cotton it would surprise me if *deshi* cotton were grown on it. *It is more suitable for American cotton than the Lower Bari Doab Canal Colony*

One tenth of the area, *i e*, about 200,000 acres, would probably be under cotton and the probability is that this would be American cotton rather than *deshi*, if the present premium is maintained It would be essential to take steps to advise the people and help them with seed etc.

Sardar JOGENDRA SINGH, of Iqbalnagar, Montgomery District, Punjab.

EXAMINED AT LAHORE, JANUARY 8th, 1918.

Written statement

I.—AGRICULTURAL EXPERIENCE.

(c) Exotic cotton

726. (20) Experience.—I have land in Gujranwala, Amritsar and Kheri (Oudh) but my direct experience of the cultivation of cotton is confined only to Iqbalnagar, Montgomery District. In Amritsar and

grown. I

5 acres and the holder of 25 acres puts under cotton from four to six acres, one fifth of the holding can be easily placed under cotton.

729. (23) Comparative returns.—The only exotic cotton which I have grown is 4 F American

after wheat.

732. (26) Suitabilities of existing varieties.—The Agricultural Department in the Punjab are pushing for all that they can, 4 F. which *has proved the most suitable variety* *Other varieties are said to be* under trial. The Department has won the confidence of the people and large private farms can also assist the introduction of new crops greatly.

733 (27) Prevention of mixing of different varieties.—To prevent mixing :—

(*a*) Mixing in the fields can be prevented by distribution of pure seed and rooting out of the *deshi* plants after careful inspection.

Once the producer

entive towards the

by Gulzari Mal and Kirparam who came from Lahore. Messrs. Ralli Brothers, and Forbes, Forbes, Campbell and Co. did not attend the auction. I think if we could offer godown facilities to the purchasers the competition would become greater and bring in higher prices. I had no facilities whatsoever. The acution was just held in the open fields. Labh Singh, the Agricultural Assistant, and Mr. Haverty arbitrated in cases of disputes. One special feature of this auction was that the seller was allowed to put a reserve on cotton. We got more than the reserve prices in all cases.

759. So far as my experience goes, cotton does not require more labour than wheat. If sown in lines, it is easier to grow and to intercultivate. We had no difficulty in arranging about picking this year. We gave the pickers *one-tenth of the daily pickings*. My total cultivation under cotton was 25 per cent. of the whole area; if I got more water I would grow more cotton. So far cotton has been quite a safe crop with me though it is a delicate plant. This was a very bad year for cotton as the rains in some areas spoilt the crop entirely. The average yield this year including what I have given to the pickers is about eight maunds an acre.

760. As to my proposal to buy water by bulk, I am offering the figure the Chief Engineer has worked out as the average which he gets per cusec. It is his own figure but he does not accept it. He wants more. The advantage of this system will be that I could indent for my supply, use it economically and shut it off when I don't want it. It will be an incentive to the economic use of water.

761. My enquiries from a number of people show that they would take thirty to forty per cent. more water for *kharif* if they could get it at a reasonable rate. It will lead to the extension of cotton cultivation. Cotton would then become the principal crop in *kharif* as wheat is in *rabi*. I think there is a certain amount of competition for labour between the harvesting of wheat and the sowing of American cotton. The harvesting of wheat begins about the 12th April and it is just the time when cotton sowings are in progress, though cotton can be sown as early as 15th March but the *rabi* supply in the canals has not been good and the water in March is used to give the last watering to wheat.

762. (*Mr. Henderson.*) I am cropping wheat and cotton only. I cannot say if the soil is likely to deteriorate. So far as I know, there should not be any reduction in the fertility of the soil, if rotations of crops is properly arranged and the soil is allowed to rest and recuperate. Next year I hope to have a thousand acres under cotton and 500 under wheat and that will allow the other 500 acres a rest for half the season. A quarter of the land is resting now. I am not growing any leguminous crops at present. Later on, I expect I shall have to green manure the land which is resting. In the Punjab, immediately after wheat, the land is ploughed up and cotton is sown and it gives fair yields. It is a very general practice in the Punjab to sow cotton in wheat land. At least thirty per cent. of the *deshi* cotton is sown in this way. I have not tried American cotton in the wheat land, but had nearly five acres under *roseum* cotton and it gave six maunds an acre. I begin the harvesting of wheat by the 12th of April. It takes about twenty days to harvest the crop on five hundred acres, so that harvesting goes on into May. They say the cotton land gives very good yields of wheat and that wheat land is good land for cotton. Cotton land is ready for ploughing in February when it is given a first winter ploughing, then kept fallow and ploughed for wheat in summer. Similarly, wheat land can be ploughed in July for cotton. I cannot say whether it is possible to go on indefinitely on a fixed rotation in this manner. It may be necessary to grow leguminous crops or green manure the land to obtain good results. We get good silt from the canal. I cannot say anything definite about the growing periods of *deshi* and American as I have not grown *deshi*. I like to begin the sowing of American cotton by the 15th March. I consider an average crop of fifteen maunds of wheat to the acre a good crop. I got only ten to thirteen maunds on an average so far, but I was never able to water my wheat crop properly. A crop of ten maunds an acre is not worth growing. I grow wheat on fallow land only at present.

763. (*Mr. Ashton.*) I have not taken *bhusa* (stalks of wheat) into account. *Bhusa* in an ordinary village away from the railway line, does not bring much profit. It has to be sold at 2½ maunds to the rupee. In the case of a large majority of cultivators it is required for the cattle. I have never suggested that the growing of wheat should be discouraged. Wheat is the main *rabi* crop and the staple food of the people.

764. I cannot say whether cultivators keep their watercourses as clear of silt in the *kharif* as they do in the *rabi*. Of course, if they keep the watercourses clean they can get a better supply. People in the villages are beginning to take a greater interest in these things than before. I think that the supply of water by bulk would be an incentive to keep the watercourses clean.

765. (*Mr. Hodgkinson.*) I sow my cotton in lines. There are very many people who are doing that now, but it is generally sown broadcast. People are beginning to discover the advantage of interculture. I don't think any compulsion is required to make the people sow their cotton in lines. The inducement of larger yields is the best incentive.

766. I would suggest that the report of the Agricultural Department should be printed in the vernacular so that people may know the results of careful and scientific cultivation of crops. The report is published in English and the people know nothing about it. The report of the results obtained at the Government Farms should be published in the language of the province and distributed free in the villages so that every one could read it.

767. As regards marketing, better arrangements should be made. At present there is no class above "A" which is just cotton that is free from *deshi*. We get no premium for a better class of cotton, in strength, staple, quality and yet if improved cotton is to be grown, superfine cottons ought to get a better price. Marketing is very unsatisfactory. I have no experience of 280 F. 3 F is not such a satisfactory cotton as 4 F.

768. (*Mr. Wadia.*) The price obtained at the auction at Khanewal was as high as Rs. 23 per maund, which was due to there being good competition. As regards my private auction, the people were not very confident about the success of an auction arranged by a private person. The sellers and purchasers held out for a long time. They were not sure of the success of the experiment. There was practically no competition. The Japanese and Lala Gulzari Mal were the only purchasers. No other buyers turned up. The main thing that kept the buyers away was that railway traffic was closed and there was no place at Iqbalnagar to godown the *kapas*. The auction at Khanewal was a greater success because there is a *mandi* there and purchasers, having confidence in the Agricultural Department, turned up.

769. I cannot work out local prices from the telegrams without the help of the tables published by the Agricultural Department. An eight maund yield of cotton per acre means at current prices something like Rs. 150 an acre, while wheat with an yield of fifteen maunds an acre at Rs. 4 a maund means Rs. 60 per acre.

770. The people of the Punjab prefer to grow wheat because it is the principal *rabi* crop. In *kharif* they grow less paying crops as a matter of habit. It is true in the Central Punjab, people concentrate on *rabi* rather than on *kharif*. Sugarcane, cotton, *juar* and *makki* are the principal *kharif* crops. *Taria*

[illegible] by the *arhtyas* who are really acting on [illegible] he prices down as much as possible and [illegible] no facilities for storage in the way of [illegible] there are too many carts in the bazaar, [illegible] ombay prices influence local prices only [illegible] evel of prices is not allowed to go up. At the auctions there are always three or four large purchasers who are in touch with Bombay market and also the world prices and they bid against each other up to the fullest limit.

772. *I have been told that the Bombay market does not want pure American cotton.* They want a [illegible]

[illegible] njab which [illegible] be ginned [illegible] financing [illegible] y solution [illegible]

775. I think the cultivators on the Lower Bari Doab Canal could take fifty per cent more water than *they are taking at present for kharif. The canals are so constructed that the minors take the same* quantity of water both for *kharif* and *rabi*. If more water in the *kharif* could be let into the canals, there is hardly any doubt that it could be used to great advantage for growing cotton and sugarcane. It would help both crops very much. There are no wells in my district for irrigation purposes. The water level is very low. If the rate for exotic cotton was reduced still further, it would undoubtedly encourage the growth of cotton. The present water rate for wheat is Rs. 5 and for cotton Rs 4 per acre, as far as I can remember.

Sardar DARSHAN SINGH of Vahali, Deputy Director of Agriculture, Hansi, Punjab.

Examined at Lahore, January 9th, 1918

Written statement.

I.—Agricultural Experience.

(a)—"Desis" short-staple cotton.

776. (1) Experience.—I have been in charge of the Agricultural Farm for the past three years; and been constantly visiting the districts of Hissar, Rohtak, Karnal and Ferozepur. I was also stationed for a few months at Lyallpur. Besides the above I have, during the period of my studentship, often spent time in the Chenab Colony. During this time, I have been in actual touch with the cotton cultivators and their conditions.

777. (2) Varieties.—The cotton grown is a mixture of the four types, *i.e.*, *Gossypium indicum* and *neglectum*, white and yellow flowered. The longest staple has never exceeded ·9 inches in length, and that only in occasional plants of certain varieties; hence I class them all as short staple.

(2) *Distribution.—Rohtak and Hissar.*—In general the seed is obtained from factories and the cultivator is not particular about the proportion of various types; though he would seem to favour the white flowered varieties. As a rule the yellow flowered *indicum*, forms the major portion of the seed used.

Karnal.—Here the cultivator seems to be more particular in the choice of the seed; and *neglectum* white flowered is the predominating type; and very often one comes across fields of almost purely this type. *Indicum* white flowered comes a good second. Yellow flowered varieties are seldom grown.

[illegible] acres being grown in the [illegible] various tracts according to local conditions. [illegible] jab Gazetteer as containing twelve acres of which ten acres are cultivated. But the average area per shareholder is ten acres of which eight acres are cultivated. In Hissar, land has been usually plentiful and the distribution of land is on the

bhaiachara and *pattidari* systems. The holdings on the whole are much larger than Rohtak and a tenant possessing one plough would cultivate from 20 to 25 acres of land under mixed canal and *barani* condition.

(2) A very good idea of the proportion of cotton is gained from the following figures obtained for three fairly large canal distributaries on the Delhi Branches and irrigating a typical cotton tract lying in Karnal district on the border of Rohtak district. The total commanded area of these distributaries is 102,765 acres with a cultivable area of 76,669 acres. The area proposed to be irrigated annually is 37,674 acres. The average irrigation done by these distributaries taken over a period of seven years from 1905-06 to 1911-12 has been 28,058 acres (*kharif* 13,755 and *rabi* 14,303 in acres). The area under cotton for these seven years averages 6,460 acres per *kharif* or 47 per cent. of the total *kharif* irrigation. (The remaining 53 per cent. is made up of 42 per cent. under sugarcane and 11 per cent. under miscellaneous *kharif* crops such as juar, rice, etc.)

(3) Analysis of an average plot of one hundred acres in this tract irrigated by canal water is given below:—

Kharif—	
Sugarcane	20·5
Cotton	23
Kharif fodder	2·5
Kharif food	3
	49
Rabi—	
Wheat	39·1
Barley	1·5
Gram	2·0
Other fodder *methi* crops	8·4
	51·0

(4) It would be safe to assume that in canal irrigated tracts, the cotton cultivation is 23 per cent. of the total area. Figures of various districts over the entire area are given in the statement attached to this note. (Annexure I.)

779. (4) **Yields and profits.**—The results of our crop experiments conducted, for the past two years in typical cultivator's land, with a view to arrive at average yields per acre of cotton in Hissar district are given in the statement attached to this note. (Annexure II.)

(2) In Rohtak and Karnal districts, no actual experiments of this nature were carried out by us; but figures taken from the Gazetteer show that $7\frac{1}{2}$ maunds per acre of cotton is a fair average for irrigated land and three to four maunds an acre on *barani* land. The cultivator's profits will depend on the market prices which he can get. The cotton of this quality has sold at Rs. 4 per maund in 1914, Rs. 8 in 1915, Rs. 9 in 1916 and is now selling between Rs. 12 and Rs. 13. If we apply a rate of Rs. 10 as the future normal rate, the gross income per acre would be Rs. 50 for Hissar district and between Rs. 40 to Rs. 75 for Rohtak district. If we deduct the value of seed, all labour and ploughings, hoeing, watering, picking, etc., at Rs. 25 to Rs. 30, the net profits will be between Rs. 20 to Rs. 25 per acre in Hissar district and Rs. 15 to Rs. 40 in Rohtak. This latter however, appears to be rather high.

780. (5) **Rotations and manures.**—The usual rotation is that cotton follows either wheat or gram after which the land is left fallow till the succeeding *rabi*, when it is again sown with either of the above named food grains, thus:—

Sown in October, cut in April.	Sown in May or June, cut in December.	From December to October of the following year.
Wheat or gram.	Cotton.	Fallow.

(2) Cotton also often follows cotton, the land having either been left fallow for the intermediate period December to May or June) or sometimes a leguminous fodder crop like *methi* being taken, *e.g.*—

Sown in May or June, cut in December.	Sown in May, cut in December.	December to October.	Sown in October, cut in April.
Cotton. *Senji* may be taken here.	Cotton.	Fallow.	Wheat or gram.

(3) In the Rohtak district, cotton is usually grown after harvest of gram. When it is grown after wheat some farmyard manure is applied if it is available.

(4) In the well irrigated tracts of the Karnal district, the following rotation is usually adopted:—

Wheat. Cotton. *Methi* in standing cotton. Sugarcane. Fallow.

Surgarcane is also sometimes followed by cotton. In certain cases a double crop of sugarcane is taken and in such cases it is heavily manured. The ordinary rotation of—

Wheat Cotton Fallow

is also quite common in the Karnal district.

781. (6) **Comparative returns.**—There are no *deshi* long-stapled cotton grown, nor are exotic cottons grown by the ordinary cultivator. For co[illegible]ive returns of various *deshi* varieties as well as of American at our farm, please see [illegible] nent on [illegible] ed. (Annexure III.)

(2) Sugarcane an[illegible] s are t[illegible] ated crops. Fodder crops they must grow to provide food for th[illegible] the ar[illegible] dy [illegible] ttle in Hissar, besides its being more paying wherev[illegible] own.

782. (7) **Condition**[illegible] in Hissar and Rohtak. [illegible] ms to fluctuate much [illegible] exure I.) In Hissar,

about 75,000 acres, in Rohtak it is about 70,000 acres. The canal supply chiefly controls this factor and ly rains decide as to what area may be grown with cotton The grower usually awaits rains for his ings The cultivator considers cotton a paying crop The water supply is the deciding factor as to the a that he can put under cotton. A study of the figures of irrigation on some of the channels mentioned paragraph 778 shows that in five out of seven years (1905 11) the area under *barani* crop has varied tween two to eight per cent of the total area

783 (8) Uses of seed and seed selection —As in these districts cattle breeding is widely practised, eed is chiefly used for cattle food, the deficiency in the home supply being made up by importing from outside Only about two per cent to three per cent seed goes back for seed purposes. No oil extraction is done.

(2) Seed selection is not practised at all There is, however in some villages of Panipat Tehsil some inclination of sowing white flowered varieties only In Bhatla village of Hansi Tehsil people used to go in for selection till a few years back, when they lost their entire standing crop on account of severe hailstorms. Since then they have been purchasing factory seed and have taken no pains to select.

(3) Hand ginning is practised on a small scale, but not with a view of getting good seed, and merely because to sell cotton and then to buy lint from the factory would be more expensive than to gin one's own cotton at home and also saves the worry of a double transaction, besides providing the cultivator's wife with occupation for her long winter nights when she usually gins enough to meet her household requirements.

784 (9) General economic conditions —Both in the Hissar and Rohtak districts, the cultivators prefer white flowered varieties to the yellow flowered, and if pure seed was available, they would go in for it It seems desirable that the Agricultural Department should endeavour to provide them with selected seed of *deshi* acclimatised varieties. There is no doubt, that it might pay a cultivator better to grow American cotton but at present there seem some obvious difficulties in his way

785 *Difficulties in regard to the introduction of American cotton* (a) *Rotations* —As mentioned in paragraph 780 the usual practice is to grow cotton after wheat and thus is not off the soil till quite late sometimes the middle of May even a[...] the sowings of American cotton get much delayed A cultivator can grow American cotton, only [...] present rotation or (b) sows cotton in fallow land American cotton in colony area [...] unknown in this tract If the crop, were introduced after duly [...] her it would pay the cultivator to grow [...] from the analysis of a hundred ac[...] g his fodder which is absolutely incumbent on [...]), then American cotton would follow a systematic rotation As the [...] le in Hissar, therefore cotton area growing in rotation with this cannot be very large

(2) (b) *Fallow land* —The question of growing cotton on fallow land is also a difficult one for the cultivator, because though there is enough land, and the percentage of area at present cultivated would allow of such practice, he usually takes crops from such of his lands as are most handy for him to irrigate, and are nearest to his water outlets He selects his fields for this purpose and this practice saves him extra expenditure of making and keeping up other *khals* etc , and the bother of breaking other land, as also being near the water supply he can irrigate more Thus one would often come across an area from which both *rabi* and *kharif* crops are taken while the same *zamindar* has plenty of other land which has been lying fallow for quite a considerable period of time To put it in other words, the following difficulties occur in largely breaking up new areas to take up fallow for American cotton —

1 The allowance of water on the canal in this district is not quite so liberal as in other colony canals.

2 There is not enough tenantry or, to put it in another way, a larger area is required to produce enough crop for supporting him and his family

[...]tivator is thus forced to restrict his cultivation on land lying close to the source of his water supply [...]pping He has therefore very little encouragement to break his fallow land On [...]k up his wheat fields after harvesting them As I have mentioned [...]ere large and therefore the cultivator naturally [...]noval of a *rabi* crop is much simple[r] [...]bings and then broadcasts his see[d] and requires muc[h] [...]ds etc) while if he were to prepa[re] (the land after *rabi* crop is clean, tha[t] [...]re his seed bed with a larger amou[nt] a fallow land, he would have to give many more ploughings [...] of labour which, being too lethargic, he is not prepared to put in, besides the land being plentiful he prefers sow a larger area expecting that a small return per acre on this would bring him more than a small area w[ith] good cultivation

(3) (c) *Shortage of water* —The shortage of water has two aspects, viz (i) the annual permissible ir[riga]tion on these canals is less and (ii) out of this there is very little to spare at the time of sowing American co[tton] Last watering to wheat is usually given at the end of March and sometimes in the beginning of April American cotton growers would require the r *palewar* (first watering) at about the same time This c[...] with the interests of the standing *rabi* crop which is ready to be harvested and a cultivator cannot a[...] his wheat crop to irrigate his fields for cotton. The period of drought or shortage in canals expe[...] during winter months, is not fully over by April and May this coupled with the cultivator being eng[...] harvesting his *rabi* crops, presents quite an unsurmountable difficulty in the way of introduc[ing] American cotton. By June the supply in canals improves, and the cultivator, being more free, begin[s] his *deshi* cotton, which extends well into the time that the monsoon rains break and lend him a [...] hand by drenching the soil for him. American cotton also requires its final watering in October[...] canal supply in that month again becomes low, as well as water is needed for *rabi* sowings then. [...] Karnal district, however, where the area under sugarcane is much larger, cotton mostly follows [...] There is thus a fair chance of introducing American cotton here, as it can be sown well in time irrigated tracts, the extent of the area sown would depend on the supply of water There are already a good number of wells, which show prosperous cultivation and one feels hopeful of on sinking new ones. The spring level is comparatively high, though it differs in the *bangar* tracts. These wells can serve the purpose of supplying water at the critical times. On this c[...] also the cultivation of American cotton can be increased.

786 *Necessity for leguminous crops* —As no manure is applied, and farmyard manure is used in manufacturing "*uplas*" (dung cakes for fuel) the encouragement, as far as possib[le] [legu]minous crops becomes highly desirable, and Government might well make suitable conc[...]

end. The question might well be asked that remission of canal rate for green manuring has not resulted in making that system very popular with the cultivator. The ordinary cultivator is too ignorant and his horizon is very limited. He cannot bear to see the loss of his standing crop (which has to be ploughed in for the improvement of his land) which is almost ready to be harvested at the off-chance of getting better produce for his succeeding crop.

(2) The growing of leguminous crops, which even after natural maturing and removal, will leave the soil richer than before, is the obvious solution which gets over the cultivator's objection. Some of these leguminous crops which I propose to suggest for adoption have the added advantage of requiring comparatively less water. These crops will be in addition to the present cropping and do not take their place, and when grown, these will bring profits to the cultivator as a crop, and at the same time enrich the soil. Therefore the growth of these crops will, in themelves, be a source of additional revenue, and such excess receipts may either be waived, at least in early years, to encourage the cultivator adopting them, or a portion of these revenues reduced as allowance or concession.

(3) The following leguminous crops are suggested for adoption as needing less water and being very beneficial:—

1. Indigo, after wheat, sugarcane, or cotton in the fallow land before wheat (this land would otherwise remain fallow and bring nothing to the cultivator or to Government).
2. *Senji* or *methi*— in standing maize or cotton; before growing sugarcane or cotton.
3. Grams after *juar*, etc., when ordinarily the land would remain fallow.

(4) As these crops will be sown mainly with a view to improve the soil conditions, it would be only right that the areas put under them do not count towards making up the permissible areas to be sown on any system of canals; it will thus be a direct encouragement for growing them.

(c) *Exotic cotton.*

787. (20) **Experience.**—In the early part of my service, I spent about nine months in the Chenab Colony where besides the training and observations made at the Agricultural College Farm, Lyallpur, and inspections out in the district, I had great facility in watching and studying the actual field conditions in the large estates of my family in that colony, and this advantage has all along been very helpful to me in making comparison between actual field and farm experiments. In the beginning of 1915, when the Montgomery district formed a part of the Hansi agricultural circle, I had to distribute the seed of American cotton (4F) for the first sowings made in this colony and it is a happy result to see that it has proved such a great success; more than was considered to be possible in so short a time.

788. (21) **Varieties.**—The exotic cotton now grown is chiefly 4F American. Before this Dharwar cotton commonly known as *narma*, was in favour.

789. (22) **Size of holdings.**—Each tenant with one plough as a rule cultivates about half a square, *i.e.*, about $12\frac{1}{2}$ to 13·9 acres. Where soil conditions and canal supply are particularly favourable, a tenant has enough to do on a small area of ten acres. Such a tenant generally has $2\frac{1}{2}$ acres under cotton.

790. (23) **Comparative returns.**—The profits per acre of American as well as other varieties vary a good deal, depending upon season conditions. If, for instance, frost sets in early, and the late fruit of the crop is lost, the profits will be greatly reduced, and unfortunately American cotton suffers from this much more than the *deshi* does, as it fruits later. On the other hand, if heavy rains or east wind start at the time of flowering of *deshi* cotton, this crop suffers to a larger extent than does the crop of American cotton. The reason for this is that in the case of *deshi* cotton, almost all flowering is confined to a very short period of time, which in the case of American cotton extends over a considerable period. The prevalence of these adverse conditions, therefore, affects the latter less than it does the former.

(2) The average yield of American cotton per acre for a fairly good crop may be taken at seven to eight maunds per acre. Allowing Rs. 15 per maund as normal future rate, this would work out to Rs. 105 to Rs. 120 an acre. The average yield of *deshi* cotton may be taken at seven to eight maunds and allowing a rate of Rs. 10 as normal for the future, this would give Rs. 70 to 80 per acre. After deducting from these figures of gross produce value, the cost of growing the crop, which may be taken at Rs. 35 to Rs. 40 per acre, the net income will be between Rs. 35 to 45 for *deshi* and between Rs. 70 to Rs. 80 for American.

791. (24) **Rotations and manures.**—In the canal colony, cotton follows chiefly *toria* and also sugarcane to a small extent. It also follows *senji* or *methi* that has been sown in a standing maize crop. It seldom follows wheat or gram, because as said before, it becomes too late for sowing American cotton by the time that wheat harvesting is finished. In such cases the cotton sown would be any of the *deshi* varieties, *Multani* or *sanguineum* being at present preferred in the colony. It may here be added that, whenever sowing is to be done after wheat, only *deshi* cotton can be grown, and hence it is necessary for our department to make the seed of selected *deshi* variety available to the cultivator, alongside with the American seed.

792. (25) **Conditions affecting increase in area.**—It would seem feasible that a working plan could be adopted to increase the area under American cotton by securing that the allowance of periodical supply in various canal systems be increased in case of those where American cotton sowing has been fairly established. The distribution of supplies will be fairly elastic, so that the backward canal gets its enhanced requirements when people begin to appreciate the advantage of growing American cotton there.

(2) In summer, the rivers have usually more water in them than the requirements of the canals. The outlets are designed to suit the winter supply, and if more water is available in summer, some method should be devised to take full advantage of the opportunity and as far as possible efforts should be made to make the maximum supply of water available to the *zamindar*.

793. (26) **Suitability of existing varieties.**—So far as we know, 4F American has been very successful in the Canal Colonies but there is little doubt there is a great scope for further improvements. For instance the lint of 280F given out by the Economic Botanist is of greater value per maund. Instances are not wanting already which indicate that the staple of American cotton 4F is likely to deteriorate tremendously in the cultivators' lands. It is therefore necessary to give more regard to selection of seed.

794. (27) **Prevention of mixing of different varieties.**—To avoid mixture in field and factory and to keep up the vitality of the seed, the Department should give out a certain amount of fresh seed every year, to so many mother seed farms where it can be multiplied on a much larger area. Here the Agricultural Assistant of the Department should go and weed out any foreign plants. Such cotton should be ginned under the departmental control and if possible at Department's own ginneries; and then the seed should be distributed to the cultivators for the next year's sowings. Thus it would be possible to provide fresh

any confidence, and it will be very unfortunate if the adoption of such system were to result in any antipathy of the cultivator and a loss to the country's produce. However it is important that the Department should from time to time import fresh seed and acclimatise it selections from which after several years trials will suit the country's requirements

II.—COMMERCIAL ASPECT

796 (30) Local trade customs.—In the Hissar district, the cultivator brings his cotton to the town [illegible]

produce of this *tehsil* being also consumed in Panipat) Tehsils the factories sometime advance to cultivators in September or October the entire price of the cotton he stipulates to sell But in these transactions, the rate is usually less by about one rupee per maund. No other future buying or stipulating is done by the

that a buyer may force the hands of a cultivator seller at his own rates

IV.—MANUFACTURE.

798 (36) Type and number of gins and presses.—In most of the factories Platt's gins either single or double rollers, are used single roller being more common

799 (37) Size of bale.—The size of bales produced at Hansi is 18″ × 18″ × 50″, the weight being 392 lbs per bale, i.e., ninety cubic feet per ton

VI.—IRRIGATION

800 (51) Wheat *versus* cotton.—In the Hissar tract with its large herds of cattle and need for fodder,

supply on the Western Jumna Canal is in April and May [illegible] are given to cotton, very seldom if ever so many as five More often the cultivator cannot afford to give more than three

802 (52) (b) Watering of cotton.—The water consumed at the first watering is much more, say, five to six inches. The remaining two to three waterings are about four inches each Thus about fourteen to eighteen inches of canal water is given i.e., 1,400 to 1 800 tons per acre the first watering being given at the end of May or beginning of June the second in August and the third or last in e in September

*ANNEXURE I.

Area under cotton in the Hansi Circle

Name of district	Year	Area cropped in acres	Cotton in acres
Hissar	1906 07	2 508 153	85,110
	1907 08	2 242 430	104 137
	1908 09	2 560 794	67 270
	1909 10	2 453 158	71 532
	1910 11	1 956 911	64 774
	1911 12	1 064 740	74 880
	1912 13	1 566 696	46 037
	1913 14	1 916 906	84 831
	1914 15	2 498 582	73,231
	1915 16	3 931,957	43 721

Punjab.] Sardar DARSHAN SINGH. *[Continued.*

Area under cotton in the Hansi Circle—contd.

Name of district.	Year.	Area cropped in acres.	Cotton in acres.
Rohtak	1906-07	1,013,237	85,001
	1907-08	262,017	94,191
	1908-09	757,241	72,517
	1909-10	9[illegible]5,631	103,650
	1910-11	970,362	72,317
	1911-12	875,467	37,112
	1912-13	339,202	61,199
	1913-14	531,175	100,587
	1914-15	1,2[illegible]1,197	71,606
	1915-16	577,684	29,061
Karnal	1906-07	1,671,672	85,951
	1907-08	473,682	79,833
	1908-09	815,026	71,675
	1909-10	1,019,759	61,880
	1910-11	1,065,216	67,452
	1911-12	890,700	52,420
	*1912-13	975,892	59,874
	1913-14	557,513	78,710
	1914-15	1,072,811	58,714
	1915-16	656,831	29,262

* Figures for Karnal district from year 1912-13 to year 1915-16 are exclusive [illegible] to mature).

ANNEXURE II

Statement of Results of Crop Experiments for season 1915 16

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
											WEIGHT OF PRODUCE		PRODUCE PER ACRE		
Serial No.	Assessment Circle	Village	Kind of crop	Area sown with the crop	*Class of* irrigation	Status and resources of cultivator	Detail of cultivation in three preceding seasons	Detail of village manuring and watering for present crop	Name and rank of officer and date of making the experiment	Area cut	Grain	Straw	Grain	Straw	REMARKS
1	*Nahri*	Narnaund (*Hansi* Tahsil)	Cotton	Big 4 Bis 17	Canal irrigation	*Ordinary cultivator in debt good bullocks and owned 60 bighas Jat by caste*	*Mehla Chari* *Mehla Chari* Cotton Wheat Fallow	Farm yard manure 200 mds per acre 10 ploughing 2 waterings after sowing *3 hoeings*	S Darshan Singh D D A Hansi 12-10 15 to 22 12-15	Big. Bis 0 15	Seers ch 9 9 lint	Seed Seers ch 21 5	Lint Seers ch 61 6	Seed Seers ch 136 5	Crop average *The land was meant for sugarcane which was not growing owing to want of rains Crop suffered from drought*
4	Chak Nahri *No Had* bast 130	Sorkhi (*Hansi* Tahsil)	Cotton Nahri	10 14	*Nahri*	Cultivator is Lambardar No of cattle 9 Family members own 609 bighas cultivates 150 bighas not in debt Jat by caste	Fallow *Jowar* Wheat *Fallow* Fallow Cotton	No manure 4 ploughings before sowing 4 hoeings 3 waterings	Gajendar Singh *Acting Assistant* 8-12 16	1 7	21 0 lint	Mds Seers 1 3 Cotton seed	Mds Srs ch 1 34 11 lint	Mds Srs ch 3 32 15 Cotton seed	Rather late crop clay soil average crop, *no damage season suitable*
5	Do 124	Tall (*Hansi* Tahsil)	Do	5 14	Do	Ordinary cultivator 2 bullocks, No of cattle 8 No of family members 5 cultivates about 90 bighas of land in debt *Mali by* caste	Wheat Chari Fallow Fallow Fallow *Fallow*	100 mds of Farm Yard manure 3 waterings 2 ploughings 3 hoeings	Do 2 2 16	1 8	34 8 lint	Mds Srs ch 1 33 8 Cotton seed	Mds Srs ch 2 38 7 lint	Mds Srs ch 6 11 12 Cotton seed	Good loam soil early sown rains favourable, *the crop was good* yields above average

ANNEXURE III.

Statement showing valuation of lint of cotton grown at Hansi Agricultural Station in 1916.

Serial No.	Name of Variety.	Weight of cotton.	Weight of lint.	Percentage of lint to cotton.	Valuation of cotton lint per maund.	Net amount.
		Md. srs. chs.	Md. srs. chs.		Rs. A. P.	Rs. A. P.
1	Neglectum white flowered Bh. S.	11 10 8	3 37 4	34·9	31 10 0	124 5 3
2	Neglectum yellow flowered Bh. S.	8 19 1	2 27 12	31·8	31 2 0	83 13 6
3	Indicum white flowered Bh. S.	10 31 10	3 38 2	35·09	30 6 0	120 1 2
4	Indicum yellow flowered Bh. S.	6 10 3½	2 3 4	33·3	30 10 0	63 11 9
5	Local Bhatla . . .	10 35 5½	3 21 4	33·08	30 2 0	106 10 0
6	Indicum 135A . . .	7 17 0	2 4 15	28·6	32 2 0	67 11 5
7	Roseum 87. . .	8 39 10½	3 2 10	34·1	31 10 0	96 15 2
8	Mollisoni 24 . . .	7 3 4	2 21 1	35·7	32 0 0	80 13 7
9	Roseum 132 . . .	10 25 1	3 36 6	36·8	31 2 0	121 10 10
10	4F	8 8 15½	2 27 4	32·6	37 10 0	100 14 1
11	280F	9 36 13	3 11 2	33·8	41 10 0	136 9 1
12	161 AF	5 3 1	1 21 15	32·0	41 10 0	67 9 3
13	275 F	8 8 15	2 28 8	33·0	39 10 0	107 7 8

Sardar DARSHAN SINGH called and examined.

803. (*Mr. Roberts.*) American cotton has done very well whenever it was grown in time and properly cultivated, but it is rather difficult to sow American cotton early in my districts, owing to the various reasons I have mentioned in my written evidence. It did very well on the farm and sometimes gave very good outturns—from twelve to thirteen maunds. We have tried it with the *zamindars* for two years. The first year it did not do very well for the reason that it was not sown in time. In the second year, the trial was more complete. There were difficulties as to irrigation in time last year. Near Jhind at Rajthal the water supply was pretty good but the outturns were not so good as those of *deshi*. I think, in all cases, the *zamindars* sowed American cotton after gram or wheat. Lack of land is not a difficulty in regard to sowing in time. The chief rotation is cotton after wheat and that accounts for cotton being sown late. If it is sown in fallow lands, the cultivators have to go to longer distances and probably have to irrigate the land as well and the canal supply is very limited. They like to irrigate, as far as possible, the lands nearest the outlets. Again the cultivators are not so active as in the canal colonies and the preparation of land after wheat is much simpler. They can therefore put more land under cotton than would be possible if they were to prepare fallow land with the same amount of labour. They sow their *deshi* cotton very late, until June, and sow on until the monsoon breaks so that part of the irrigation is done by the natural rains that come about that time. Thus all these things combined result in more favourable conditions for *deshi*. If they were to sow American cotton, they would not be able to sow the same large area under American as they are at present doing with *deshi*. The competing crop against irrigated American cotton sown in early April would be wheat for which the last watering comes about the end of March. The deficiency of canal water supply that is experienced during the winter is not quite over until the middle of May. There are three canals and each canal only gets supplies for ten days during the month so that those people who cannot get water at the beginning of March will have to wait till their turn comes. It might be quite late in March or in the beginning of April. If they get their turn from 10th March to 20th March, they won't get another turn until the 10th to 20th April. If they get water at the end of April, they begin to prepare the land for *deshi* cotton and sugarcane. They begin to sow sugarcane as soon as they get water. If they can get water early enough, they sow it in March. I should not say that sugarcane competes against cotton in Hissar because the area under sugarcane is very small. It is greater in Karnal and much greater in Rohtak. My experience is that there is no water for American cotton. Lack of water supply is the only reason against it.

804. We did not give out any American cotton in my districts this year except to two *zamindars*, one in the Rohtak district and the other in Karnal. Both of them got very poor returns. It was not more than a maund an acre. In the case of *deshi* cotton, they got two maunds to the acre. I have not got the exact figures for the farm but the average was about 26 seers. I have never been able to obtain the proper premium for American cotton. The highest premium obtained was Rs. 1-8. If we got a premium of Rs. 4 to Rs. 5, I think that it would have a good effect upon its cultivation. I do not think that there are any natural disabilities about American cotton. Frost affects it a good deal because it fruits quite late. If it suits the canal colony, I do not see why it should not suit us in Hariana. A certain amount of persistence with the experiments is necessary. I do not think that leaf roller affects the yields very much.

805 (*Mr. Henderson.*) The yield of cotton in the Hissar District is fair. Our crop experiments show that it is, on an average, five maunds an acre on *zamindars'* land, but there are villages in which it is much higher, for instance the villages of Bhatla and Narnaud which are famous for cotton, where some of the best

... labour and implements are not up to date There are indications to show that the land has been gradually deteriorating under cotton and wheat, but I have not sufficient experience to give a definite opinion.

806 I have carried out experiments with green manure crops in the case of wheat and sugarcane but ...

... the cattle on the land on ...

... Hansi farm have proved ... farm has only just been started Everything is in the initial stage and we have not begun the distribution of seed of 4F I gave some out in the first two years to a few interested *zamindars* to try on a couple of acres each but the results were not very encouraging and I decided not to go on with it until I got some definite results on the farm If it proved a success, the probable area on which we should be able to introduce it in Hansi would depend upon the irrigation that is available. At present as I have mentioned people sometimes wait till the monsoon breaks to sow their cotton and part of the land is probably partly irrigated and partly dependent upon *barani* (rain) conditions Again the area sown is greater because the cultivation which has to be done is less owing to the land being pretty clean after wheat. If they had to cultivate fallow land, I think the area would go down tremendously unless of course they grew partly *deshi* and partly American. If American ... is at present under *deshi* All ... atter of fact, more seed has to ... h for home consumption I ... The *zamindar* considers that ...

	Maunds
1908 09	110 000
1909 10	431 000
1910 11	271 000
1911 12	151 000
1912 13	2.4 000
1913 14	400 000
1914 15	291 000
1915 16	1 8 000

... ultiva- ... to sell ... of this ... credit ...

no sowing in lines in Hissar, it is all broadcast.

811 (*Mr Hodgkinson.*) The valuation of the lint of 280F last year was about Rs. 4 per maund above that of 4F We only grew 280F last year and sent it for valuation whereas we have been growing 4F since we started the farm. On an average, the staple of 280F is 2 inch more than that of 4F The staple of 4F is from 9 inch to 1 1 inch and that of 280F is from 1 1 inch to 1 3 inch.

812. (*Mr Ashton*) I do not think that the statement that there is plenty of labour available in Hissar is correct. There would be difficulties in having the two operations, i.e., the harvesting of wheat and the sowing of cotton going on at the same time.

813 (*President*) Whenever cultivation is not given properly to American cotton, the staple deteriorates. I have noticed it in Lyallpur district and also at the sales in Montgomery. The staple has gone down in certain cases. I do not think it has gone down to 7 or 8 inch

Mr. R. D. THOMSON, I.C.S., Colonization Officer, Lower Bari Doab Canal Colony, Montgomery.

Examined at Lahore, January 9th, 1918.

Written statement.

814. (20) **Experience.**—I regret that I am not in a position to give to the Committee such full and definite evidence as they may desire. I may explain that such evidence as I give concerns the area known as the Lower Bari Doab Colony, and that this colony is a very new one. I was posted to it in the end of 1913, and there was then practically no cultivation of any kind in the colony area; and from April 1916 until May 1917, I was not in India.

815. *Prospects of cotton in the Lower Bari Doab Colony.*—The original programme contemplated an area of about a million acres being brought under cultivation, but, for reasons which I need not specify, this total will probably not be reached; and at present the colony is very far from being fully developed. When however, it becomes fully developed there may perhaps be some 700,000 acres of allotted land, on a fairly conservative estimate. Most of this land is and will be well suited to the cultivation of cotton; variations of quality of the soil and of irrigational facilities there must be, but speaking broadly, the conditions of climate and soil should generally favour the cultivation of cotton. Not all of this allotted area will be available, however, for cultivation; there are certain areas such as the irrigated plantations or the cattle farm where there can be no cultivation or only restricted cultivation, and the basis of the scheme of the distribution of canal water is that only 66 per cent. of the allotted land can claim irrigation. Further, of this percentage two-fifths are to be watered in the *kharif* or summer season and three-fifths in the *rabi* or winter season. Thus allowing for, say, 660,000 acres of cultivated land only some two-thirds of that area will be irrigated in the year, *i.e.*, about 440,000 acres; and of this area, only some 176,000 acres will be under summer crops.

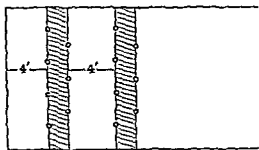
(2) What proportion of this area will be under cotton it is not easy to suggest, for, in a colony especially, the price obtainable for any crop is the chief determining factor. The greater extent of cotton cultivation this summer (1917) has been due without doubt to the good prices realized by cotton, and more especially by the long staple American cotton, or, as the colonist commonly terms it, *narma*. [The figures this year of acres sown are 80,000 acres of *narma* and 50,000 acres of *deshi*.] The question may be considered in another way; the average or standard holding is one of 25 acres. There are plenty of exceptions to this statement, as, for instance, the oat hay farm of 20,000 acres and the village menial's plot of two acres, but roughly speaking 25 acres represent the size of the average holding. Of this holding some sixteen or seventeen acres should receive irrigation, six or seven in the summer and nine or ten in the winter. Of the seven acres irrigated in the summer, as large an area as possible, *while the market prices remain good*, will be under cotton; not all long staple *narma* though, for the *zamindar* often prefers to grow some *deshi* short-staple cotton. The reasons are that (*i*) *deshi* need not be sown so exactly at the right moment as *narma* has to be; (*ii*) *deshi* is said to need less water; (*iii*) *deshi* produces more maunds of *kapas* to the acre; (*iv*) *deshi* is easier picked, and (*v*) is more easily treated by the existing methods and implements. Thus of the seven acres, prices remaining good, perhaps five would be under cotton (four *narma* and one *deshi*), and two under fodder crops with a little maize or perhaps sugarcane. But probably, unless some unforeseen trouble occurs, the proportion under *deshi* will sink and that under *narma* will rise; for, once again, the price is the governing factor, and if *narma* continues to fetch three or four rupees more per maund than *deshi*, then more *narma* will be cultivated; and the *zamindar* will forget the advantages attaching to *deshi* which he at present remembers.

(3) Thus the proportion of a holding under cotton is governed by the prices obtainable for cotton and by the irrigational considerations mentioned above. It may be worth while to revert for a moment to the latter, and to point out that though three-fifths of the area irrigated are supposed to be irrigated in the winter (chiefly, I believe, because a given amount of water can do more irrigation or at any rate produce more matured acreage in the cold weather than in the hot), and though the Punjabi tends, I think, to regard the wheat crop as *the* crop of the year yet in this colony the water charge for wheat is higher than it is elsewhere (Rs. 5 per acre), and that hitherto (it is too early to speak about the conditions of the present winter 1917-18) the supply of water in the winter in this colony has not been what was expected and desired; thus it might be possible even yet to take advantage of the favourable position afforded by present prices of cotton and to alter the supplies so as to allow a higher proportion of water in the *kharif* than in the *rabi*. I have not consulted the irrigation authorities as to the possibility of such an alteration, but if it be possible, then this is the time to make the change. Whether the colonist would approve, it is hard to say; the smaller man probably would not, the bigger man might.

(4) Again, it is not easy to quote figures of outturn per acre: the land varies much in quality and is still so to speak virgin soil, and irrigational advantages are greater in some quarters than in others. One grantee who did not cultivate or reside on his land himself told me he had got on an average ten maunds per acre of *narma* and regarded that result as gratifying. Thus if the soil be good, irrigation (and rain) favourable and the grantee cultivates himself, probably for another year or two he would get twelve maunds per acre of *kapas narma*; but where other conditions prevailed, he probably would not obtain much more than five maunds per acre. In future years too, as the soil grows older, yields will sink somewhat, though some of the lands which now give low returns will perhaps improve. Thus it would perhaps be fair to take an average yield as one of seven maunds *kapas* to the acre; this refers to American long-staple or *narma*. The yield of *deshi* short-staple is probably higher; I have made no experiments and simply state what cultivators have told me, on which authority the average yield of *deshi* short-staple might be quoted at eight maunds *kapas* per acre. This result, if it be correct, naturally reduces the apparently higher profit obtainable on *narma*. Moreover for some years to come, unless the restoration of peace makes a very sudden difference, the shortage of labour in the more distant parts of the colony is bound to affect the profit made; for instance, in some more distant villages early in November, I found that there was actually no one to pick the cotton, and that in some cases the remuneration offered to the picker was one-fourth instead of the more usual one-tenth share. But regarding such a phenomenon as a distinctly temporary one it is fair to say, I think, that *at present prices* there is no *kharif* crop to touch *narma* as a profit producer, unless it be sugarcane. But cane needs good soil, good water and careful attention even more perhaps than the *narma* does; and I doubt whether the climate and country are really suited to it.

deterioration and me
desirable that the
i e, of the Agricult
ferable to rely upor
America or Egypt.
the hands of exper
this reason have exp
better than middling American, and it yet remains to produce an *Indian grown* seed which will produce
mix, and
the value
ie preven

anal water
icrease the
area under cultivation by growing the cotton in twin lines, i e., by digging a series of little water courses and planting the cotton on either bank of the water course *vide* the sketch in the margin In this way, the only parts of, say, a one acre field needing irrigation would be the channels (shaded in the sketch) which would be about one foot broad and perhaps nine inches deep, and I asked the Agricultural Assistant, if he approved, to try this method on the seed farm at Montgomery and discover whether he could thus on the same allowance of water grow an increased area and secure an increased yield



Mr R. D THOMSON, I C S, called and examined

817. (*Mr. Roberts*) In the Colonies, the general opinion is in favour of American cotton The *zamindar* prefers American cotton because *it fetches him more It entirely depends upon the profits that he gets.*

r tempo
ortion of
i as com
nnas and
or wheat
s There
wheat if
s a slump
r in the
will be, as
Bari Doab
moment
to have

Irrigation

k
, n
und thing'

cep bank
i the area
aggravate

in a very
iar
ave
ery
uch
iem
can
one
ave

bungalows all over the place, and fairly *pukka* places in which seed could be stored. The Sub overseer or the Sub-Divisional Officer could easily be employed for the purpose of seed distribution. The difficulty is that unless you have a special man touring round like the Sub-Assistant Surgeons who distribute quinine and drugs, the work of distribution of seed cannot be satisfactorily done. I am speaking of the early days. As the seed becomes more popular, people will try to keep their own private seed supply and some have already begun to do so.

821. I think that the auction sales have been of material help. I was talking only yesterday to a man from Khanewal where there have been no Agricultural Department auction sales. At present there is no ginning factory and he was saying, rightly or wrongly, that the people there were not getting nearly as good a price as elsewhere. They cannot send their cotton away as the goods traffic has all been stopped by the railway authorities. The cotton is bought locally and as the *zamindar* wants money, especially about the time the revenue falls due, he sells it at whatever price he can get. I have not got any record of the actual price at which he has been selling but think it is quoted generally at Rs. 16 or Rs. 17 when he should get about Rs. 20 or at any rate, Rs. 18 or Rs. 19 per maund.

822. I have not seen the system of posting of prices in the *mandis* actually working yet. I have heard varying accounts about it, *i.e.*, that sometimes the telegram is held up by the telegraph master and so on if the prices have gone up too much. I think it is very desirable to have some such system to keep the people in touch with outside prices. It is a very sound thing and local opinion supports the plan.

823. It would be a good thing if auctions could be organised by the people themselves, if this could be done. I have heard accounts of the private auction that was held at Iqbalnagar. I heard that Sardar Jogendra Singh got very good prices. Some people are inclined to say that unless you have a Government expert or to settle disputes and determine classes of cotton the auctions are not likely to be satisfactory. You want an impartial arbitrator.

824. The total area under cotton last year was 130,000 acres, *viz.*, 80,000 acres of American and 50,000 acres of *deshi*. It is almost certain to be bigger this year but I do not know whether it will be as big as 160,000 acres. It all depends on the people getting seed. Even if they can get seed, 120,000 acres is rather a generous estimate for the area under American. 100,000 acres would be about right. I heard that there was some difficulty in getting seed of American cotton last year.

825. (*Mr Henderson.*) I have had no auctions of land in the Lower Bari Doab Colony since last March. Another one is coming on next March. The average price at the last auction was about Rs. 220. In the first year, the price was very high, probably excessive: in the second year it sank; in the third year it was lower still but in the fourth year it showed signs of improvement*. Anybody can bid except people in Government service. Once the man has paid the full price he is the owner of the land and Government has no further hold on it. The full price can be paid at once or, if preferred, it can be paid in six instalments.

826. There is a question of the quality of the land in this Colony. Certain recommendations have been made to Government but orders have not issued yet. One of the points pending between the Government of India and the Punjab Government is the area that will be auctioned. I should say that, regard being had to other commitments, most of the land of better quality has already been auctioned. I cannot say off hand what area has been auctioned in the past but it is roughly 8,000 acres every year. There have been at least four auctions, and we have auctioned about 52,786 acres in the past.† There is a fair amount of land to be auctioned. The point at present in discussion between the Punjab Government and the Government of India is, I understand, how much more land should be auctioned. The outturn varies enormously with the quality of the land. We have land which has been given out on rent for 500 rupees for 25 acres per annum. The average would be round about Rs. 300 for 25 acres per annum.

827. (*Mr. Wadia.*) I have stated in my written evidence that a representative of a big firm told me that when it came to ginning the American *kapas* sold at auction as containing not more than one per cent. *deshi* admixture and classified as such by the Agricultural Department, it showed an admixture sometimes as high as twelve per cent. I cannot explain it, but that is what I was told by the representative of the firm. I gathered that there was much more admixture when it came to ginning than there was said to be at the time of the actual sale, *i.e.*, than was certified by the Agricultural Department. My informant did not want his name mentioned. I was told that one man's cotton would not be looked at when put up to auction this year as he mixed last year.

The Hon'ble Mr. H. J. MAYNARD, C.S.I., I.C.S., and the Hon'ble Mr. P. J. FAGAN, C.S.I., I.C.S., Financial Commissioners, Punjab.

EXAMINED AT LAHORE, JANUARY 10TH, 1918.

(*No written statement was submitted by the witnesses.*)

828. (*President.*) *The Hon'ble Mr. Maynard*.—As to the question of linking up the work of the Agricultural Department with the cotton trade as a means of exploiting American cotton, we had a Conference last year at Lyallpur at which several members of exporting firms and their agents were present and we talked matters over with them. There is already pretty close co-operation, but I think it might be improved. I am not quite sure whether we should not have a new section of the Agricultural Department dealing more with the trade aspect than with the actual agricultural aspect. We really want some one who would deal with the transport and commercial aspect of the question. We do not deal with them now. This might expand in time into a trade bureau which would not be limited to cotton but would be a sort of exploitation bureau. I think it should be provincial and should consist of members of the Agricultural Department and representatives of the trade in its different aspects. What I had immediately in view was rather some one member of the Department who should be especially concerned with transport and commerce, who would place himself in close touch with the trade and who could put his finger on any point connected with that side of the question.

---

* Since then, *i.e.*, in the sale of March 1918, the average price was Rs. 330 odd; a remarkable advance probably due partly to cotton profits and partly to a desire to put money in a "safe" place.

† 8,978 acres were auctioned in March, 1918.

I think that every

ment evolves som

830 (*The Hon'ble Mr Maynard*) Then your commercial organization would be in touch ... freight and so on as well as being in touch with the trade I should

mic man
stage of
He is

before the
ltivator s preference for
vatering weigh with the
w faith n cotton to gain
the two crops are bound
the wheat season both
eat were reduced by ten

falls under two heads, there
late to some extent, and there
lly interfere. In the case of
mit the number of ginneries to
free hand should be given. If
order to protect the producer
not
to

n of
ink that, in the long

it. There were one or two suggestions made at the Lyallpur conference which was held last year for putting the cultivator in a better position as against the ginner. For instance, it was pointed out that, at present the cultivator is bound to take his cotton to a factory because the factory is the only place where there is storage room. He cannot take his cotton to a storage place and then take it away again if he does not get the proper price for it, so he takes it to the factory. It was suggested in connexion with the difficulty that special cotton markets should be built in which there would be storage room. Mr. Kitchin, the Deputy Commissioner of Lyallpur, said that he would try to build a cotton market at Jaranwala but I do not know whether he has done anything further. The question of co-operative ginning is one of practical difficulty: whether it could be arranged, I cannot say but I think it ought to be tried. It is rather difficult to get the cultivators to agree together in a matter of that kind which is outside the range of their ordinary experience It means a large capital and a bigger development of the co-operative idea.

837. (*The Hon'ble Mr. Fagan.*) It comes at a somewhat later stage in the co-operative movement. There are two points: one is the provision of controlled markets with plenty of accommodation, and the other is co-operative ginning. I am not inclined to legislate in regard to pools if we can possibly do without it. That is the general feeling. Legislation to control charges would be an absolutely new departure and very difficult to enforce. It is only justified by war conditions and the real difficulty would be to enforce your regulations when you had made them. If two people agree together, it is very difficult for the law to protect the cultivator against them. I should look upon legislation as a last resort.

838. (*The Hon'ble Mr. Maynard.*) Since the appointment of a Factory Inspector, Deputy Commissioners have practically ceased to be inspectors and the factories are very seldom inspected. Our Inspector has just gone off on military duty and the Deputy Commissioner of Lyallpur has taken up factory inspection with considerable vigour. The excise staff, inspectors and sub-inspectors are in fairly close touch with the revenue administration. Perhaps Mr. Kitchin's suggestion that they should do factory inspection was made on the supposition that they have not much to do. They take up petty local offences connected with excise, and look after illicit distillation. Apart from the technical inspection which only the Inspector of Factories could do, inspection by the Deputy Commissioner does seem desirable but the truth is that whilst some of the Deputy Commissioners, for instance the Deputy Commissioner of Lyallpur, would do it very well indeed, others would perhaps find it rather difficult to find leisure to do it and would not do it particularly well. In the old days, it varied very much: one man would do it very well and another would not do it at all.

839. (*Mr. Henderson*). It would not be feasible to give powers to the Agricultural Department. It is very remote from their real functions.

840. (*Mr. Roberts*).—I hesitate to suggest that representatives of the trade should be honorary inspectors. It might be a case of setting a thief to catch a thief. Of course, one advantage would be that they would know the real conditions and would know where the shoe pinches.

841. (*Mr. Henderson*). As to the prevention of adulteration of cotton, we recently discussed the question of preventing damping but I do not think we came to any definite conclusions about it. I do not know of any other form of adulteration except damping. As regards the mixing of long and short staple cotton, I think it is partly involuntary and as to that, I think the model factories which we have begun to introduce in the Lower Bari Doab Canal Colony at Okara, Mianchannu and Chichawatni would prevent any involuntary mixing in the factories. These factories have been put up on Crown lands. They have just been finished.

842. (*Mr. Hodgkinson.*) As regards careless mixing by cultivators, I think there is nothing so effective in preventing it as the good prices which pure American is actually getting at the Government auctions which have been held. I do not see how an increased demand would encourage mixing as the buyers are pretty wide awake. All the American cotton is not sold at the Government auctions. It is by their presence at the auctions that the people realise what high prices can be obtained for their cotton. The auctions are auctions of *kapas*. The cotton is mixed afterwards. I understand that there has been some deliberate mixing. I have seen some correspondence in regard to deliberate mixing after the stage at which the cotton leaves the hands of the cultivator. The particular correspondence I saw was a letter written by a selling agent at Bombay to a rather prominent grower in the Punjab, Rai Bahadur Lala Ganga Ram, and this letter said very definitely that he and his son Lala Sewak Ram had got a reputation for sending pure cotton to Bombay and for that reason their cotton always commanded a better price. There has been an idea of a system of control by which you would have a particular body of cultivators, *i.e.*, a co-operative society, which would enter into certain engagements that cotton should not be mixed. They would be placed in correspondence with the buyers in Bombay who would buy on the fact of the reputation of the particular society. That has not, I think, been arranged yet but the idea is that it might be arranged.

843. As to the control of ginning factories by a system of licenses, one would rather like to avoid legislative control if one can see one's way to do so. No one can say whether there is a mixture of fifteen or twenty per cent. of *deshi* cotton in American until the cotton goes through the spinning machinery. The fact that one particular body of sellers or an individual seller is mixing, whether carelessly or intentionally, must destroy the reputation of that body or individual and must in the long run do them an injury. Of course, the seller is out to make his profit and he stands to lose if he destroys the reputation of the article which he sells. I suppose mixing is due to failure to understand the real advantage of not mixing or because one man feels that he gains nothing by being honest and careful if other people are not careful. There must be common honesty otherwise if a man produces a good thing, it won't help him. That is perhaps the difficulty. It is the lack of combination on the part of the trader and the lack of common responsibility. If you cannot arrange to organize societies which would undertake that their cotton should come up to a certain standard and should be kept at that standard, then legislation might be necessary to prevent mixing.

844. (*The Hon'ble Mr. Fagan.*) If spinners at home had representatives out here in close touch with the factories and there were co-operation among producers out here, that would very probably, in my opinion, tend to improve matters. It seems to me that you have got to work from both ends. The spinner must be here or must send somebody here to see how things are going on. That would exercise a very great influence. Assuming that good cotton cannot be grown here, the whole thing falls to the ground but, on the other hand, assuming that you can grow good cotton in the Punjab and that Lancashire can use it with advantage, if Lancashire had its own representative out here in close touch not only with the trade in Bombay but with the ginners upcountry, I think he would be in a position to understand the real position. If you are going to have a large development, it seems to me that the organization must grow from both

ends Lancashire should be able to help in the intermediate stages. She cannot merely wait to come in after all arrangements have been made without her

to it It seems to me that something of that sort could be arranged

846 (*The Hon'ble Mr Fagan*) As far as the cultivator out here is concerned, I think that a very great deal could be done for him by co operation I am of opinion that co operative marketing is the natural thing and that as far as the cultivator is concerned, it would probably help a great deal at this end

847 As to control of ginneries, my position is very much that of Mr Maynard I should like to avoid legislation as far as possible Unfortunately once legislation is introduced, there is always a tendency to make it permanent

848. (*Mr Henderson*) I believe that Japanese have their buying agents in many places I was at Mian Channu a short time ago and there I saw one of their agents who was buying very heavily

850 *The Hon ble Mr. Maynard*—To speak frankly, one does not like regulations unless one sees where they are going to lead, and what the effect of them is going to be The people who are most familiar with the working of the law are the most unwilling to widen the scope of it They know the unsatisfactory nature of the agencies through which it has to be worked

soil but also a considerable area of loam Much of the latter [illegible]

have not made any specific estimate of the cotton area The land is being surveyed, rectangulation is going on as a preliminary to soil survey. When we get the details, we shall have to work out a rough cropping scheme with reference to occupier's rates and land revenue

derable economy of water

regard to it.

Mr. H. CALVERT, I.C.S., Registrar of Co-operative Societies, Punjab.

Examined at Lahore, January 10th, 1918

Written statement.

[illegible] to two aspects—(a) the need for wide

857. *The need for wider study of rural economics*—The Committee is attempting to solve a series of problems in rural economics and it seems to me that there is danger in concentrating on problems relating to cotton when our knowledge of the wider subject is not sufficient to enable us to preserve a proper perspective It may be that another crop would pay our cultivators better profits than cotton can; it may be that it is a mistake for the Punjab to grow wheat when cotton or some other crops will pay better even after allowing for the extra cost of living on imported wheat. We are too near the period when agriculture was confined to supplying home requirements to be able to foresee the full effects of its transition to an industry supplying

the world markets; and we are not yet in a position to guide the development of the new agricultural commerce. We are very much in the position of the manufacturer who does not know what to manufacture. The object of these remarks is to give weight to a suggestion that the Committee should press for the systematic study of agricultural economics on an adequate scale.

856. [illegible] With reference to the application of the principles of co-operation, I think there is ground for the opinion that the position is not always properly understood. [illegible]

[illegible]

(2) [illegible]

(3) I may add that I [illegible]

Annexure I.

Note by Mr. C. F. Strickland, I.C.S., Assistant Registrar, Co-operative Societies.

One objection to American cotton [illegible] that it cannot be grown on the ordinary village land [illegible] of desi, and the cost [illegible] sale.

Zamindars in irrigated areas will now sow as much American cotton as they can [illegible] but if the water supply is insufficient, American fails. And water is needed earlier for sowing it before wheat waterings are finished.

They will not usually sow in lines, because they and their tenants are ignorant and lazy. A specimen *killa* sown in lines would convince them, but it must be under their eyes from sowing to harvest, or they will think you have faked it or had extra water.

Annexure II.

Extract from "War Time and Peace in Holland" by Robertson Scott.

The Boter Controle. As already mentioned, this system, which is the best in Europe, was not initiated by the Government. It was invented by the co-operative creameries in order to guarantee the purity of their butter. When the system *got past its early difficulties and was seen to be as certain as those who devised it declared it to be*, the Government threw over it the aegis of an Act of Parliament. The system is still in the hands of eight associations of butter producers. It is for them to deal with undesirable producers; they admit or refuse admission to the *benefits of the system, as they like*. At the head of each of the eight departments of the Control—Assen (Drenthe), Deventer (Overijssel), Eindhoven (N. Brabant), The Hague (S. Holland), Groningen (Groningen), Leeuwarden (Friesland), and Middleburg (Zeeland)—is a qualified chemist as director, with a staff of analysts and one or more Inspectors. The Inspectors of the associations are on the road daily, paying unexpected visits to the dairies where butter is made or sold by persons in the Control or to places where butter made or sold by them is on sale. Wherever the Inspectors go they take samples not only of butter but of the materials used in its manufacture. Sometimes they are present when the butter sample is being made.

The analysis of the various samples obtained are carefully registered The result is, obviously, that the officials of the Control now know what the composition of the butter of each producer is at any time of the year

The Control stations are under Government supervision, and the members controlled are allowed to use the remarkable Government butter mark—of which some particulars in a moment—provided always—

(1) That the inspection of the creameries is always and in every respect satisfactory, and the creameries are always open to [illegible]

[illegible]

fats or oils

(4) That the moisture in the butter does not exceed sixteen per cent

An ingenious label—The Government mark is printed in blue ink on thin, tough paper by the Government printer A reprint of it is reproduced here, but the reproduction does not show an essential part of the label—the perforation marks When the thin piece of perforated paper is pressed on the butter by a special wooden stamp it seems in no way damaged, but if an attempt is made to remove the label it infallibly comes into separate pieces It is absolutely impossible to take off a label whole and use it again Apart from the general protection given by the arrangement as so far described, there is the fact that each label has stamped on it a letter which indicates the name of the Control station issuing it, that it also bears a separate number which makes it possible to trace the [illegible] keeping in reference to the labels issued



Under Rijkstodezicht
Label ingeniously impressed on Dutch Butter

The history of a firkin of butter—Let us follow up an actual firkin of butter which on being opened is found to have impressed on its contents a label numbered E 37222

We find—

(1) E is the letter of a parcel of 38 kilos

(2) Books of Leeuwarden Control station show receipt of labels 30,001—50,000 from Government dairy stations June 5, and despatch of 35,701—37,400 to creamery at Deinum, June 15

(3) Book of sales at Deinum creamery shows sale to Mr Beck, on July 5, of a cask of butter bearing the number 37,222

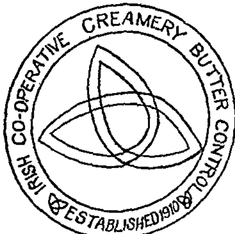
(4) Register of Leeuwarden Control station shows following record of analysis of a sample of butter taken at Deinum Control station June 23—July 8 volatile acids, 28 9—29 5, refractometer, 44 5—44 7; water, 13 6—15 7

Therefore a sample of butter of July 5 must give if analysed figures lying between the figures named That is to say, that if the sample had only twenty six per cent volatile acids it could not be pure

Result of the system—The Control system has done more than any Margarine Act to stamp out butter adulteration. The value of the Government mark having been realised, the adulterators have been beaten in the foreign market without any direct assault whatever

It is an offence punishable, not by fine, but by imprisonment only to use the official butter guaranteed improperly In 1910, 43 405 tons of butter were made under the Control

The Irish Butter Control—The Irish Agricultural Organisation Society had a co operative creamery Butter Control, based in some degree on the Dutch model, working satisfactorily last year The number of participating creameries was 32 and a considerable addition is expected during 1912 The label in use is as shown It guarantees that the butter to which it is affixed is pure Irish Creamery butter made from pasturised cream under conditions of absolute cleanliness, and that it contains less than sixteen per cent of moisture The label can only be affixed on conditions laid down by the Control, which provide for the recording of quantities made and packed, for inspection and for weekly consignments of samples to the Control, etc.*



Irish Butter Control Label.

* For further particulars see regulations of Control Committee The Plunkett House Dublin.

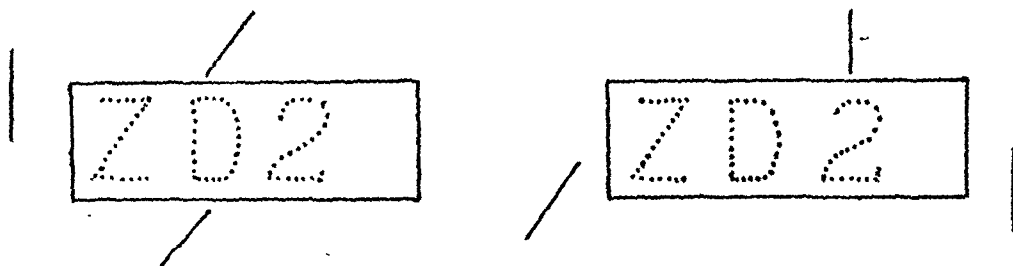
The Cheese Control.—The Dutch Cheese Control is as ingenious as the Butter Control. There are two marks: (1) a standard mark and (2) a changeable mark. The standard mark is the same design in two sizes, a big one for large Goundas and a smaller one for the Goundas a little more than 3½ lbs. This is the standard mark.



The Needle-Pricked Control Mark on Dutch Cheese.

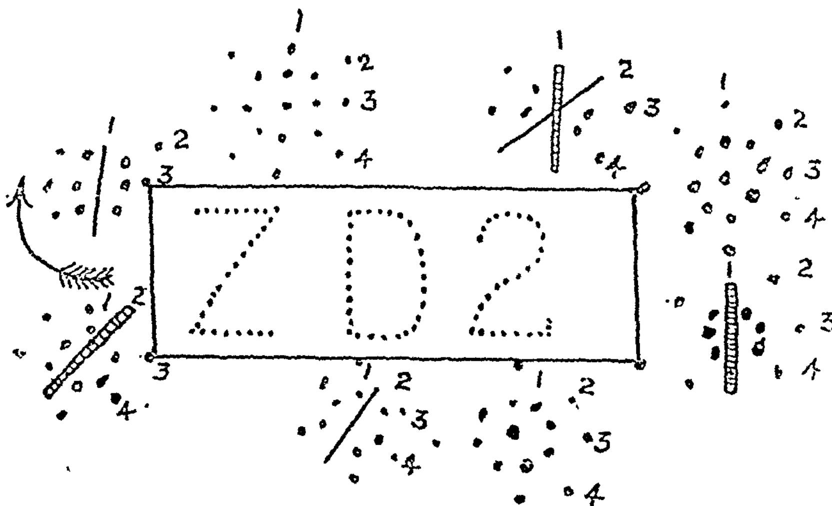
The changeable mark is the mark which is adapted to indicate the factory which has made the cheese. The standard mark is a C inside V surrounded by the words "*Ryks Controle*" in dots. The changeable mark consists of two letters and a figure in dots, all inside a rectangle, and outside that three straight lines in positions varying according to a code.

How the system works. Assuming now that the standard mark reproduced above is on the cheese, so showing it to be a—big or little—genuine Gounda, we have to take account of the changeable mark of the factory which made it. If it is factory No. 1's or factory No. 2's produce, it will bear one of the following imprints:



Signs on Dutch Cheese.

The code with which to decipher either of these mysteries is as follows:—



Key to the Signs on Dutch Cheese.

KEY TO THE SIGNS ON DUTCH CHEESE.

It will be seen that the strokes on the No. 1 and No 2 cheeses are in some of the eight possible positions shown in the code. Let us take cheese No. 1 first. You begin to count from the stroke on the left hand. At the top of the stroke is "1." Put down "1." Then follows an arrow.

The next stroke is not in the next dotted circle but in the one after, the second one. Count "0" for the blank and "2" for the stroke because it is so numbered. The three next circles are blanks Add three "0's." Then "2" for the stroke with a "2" to it. Finally an "0" for the blank circle And the result is

1 0 2 0 0 0 2 0.

The reader can try the mark of cheese factory No 2 for himself or herself and will find it comes out as

0 0 1 0 1 0 0 2

But the letters inside the rectangles ZD2 ' 1 Z is the key to the name of the Control station with which the factory which made the cheese is affil ated, D reveals the month the cheese was made 2 tells the very week. Z stands for the Zuid (South) Holland Control Station N for the Noord Holland Control Station Here are possible combinations —

Z2B Cheese made in the 1st week of the 1st month (*January 1910*) *at a dairy or factory affiliated* to to the Zuid Holland Control Station
Z2B the 1st week of the 7th month of 1910
ZC3 the 2nd week of the 2nd month of 1910
Z3C the 2nd week of the 8th month of 1910
CZ3 the 2nd week of the 2nd month of 1911
3ZC the 2nd week of the 8th month of 1911
C3Z the 2nd week of the 2nd month of 1912
3CZ the 2nd week of the 8th month of 1912

[illegible]

not less than 1 5 per cent of fat [illegible] per cent of butter fat

[illegible]

butter and cheese has been enormously enhanced

Mr H Calvert, ICS called and examined

859 (*President*) My general impression is that the economic side of agriculture is not studied in India [illegible]

of *agricultural economics* is a serious defect in the administration If one had available any good literature on the general aspect of the question then one could tackle the particular problem We are now tackling the particular problem without reference to the general question. The introduction of the co operative

862. (*Mr. Wadia.*) We are not yet in a position to employ skilled inspectors to grade cotton. They would have to be trained. The grading of cotton is not done in the primary markets but is done in the secondary markets. If we sell on agreement that our cotton is fine or is within one per cent. of pure American and it is found that any particular cotton is not up to that standard, then there would be a breach of agreement. If our organization sold under an agreement under its various trade marks, and if the article was not up to the standard, the purchaser could sue it. As to how the difficulty of distinguishing between the first and the second pickings could be overcome, I understand that the finer grading is not done in the primary markets at all. We would not attempt fine grading. All the fine grading is done in the secondary markets. The big producers' association in America have nothing to do with grading. The grading is done in the secondary markets of New York and New Orleans prior to export to Liverpool The future sales are done in the secondary markets in America. Our primary market will have spot sales only as at present. We shall sell here: the Bombay purchaser will come to the Punjab. He will buy on inspection and he will pay on the basis of the article that he is going to get. If he wants to re-sell, he would regrade himself as in America.

863. In the last paragraph of my written evidence, I have suggested legislation rendering infringement of a trade mark by others punishable with imprisonment with or without fine. It is punishable now but only with fine. In Holland in order to control the adulteration of butter, they have abolished the imposition of fine and have made imprisonment compulsory. That has had a very excellent effect.

864. (*Mr. Henderson.*) Inspectors would be paid by our own organization. These inspectors will not be Imperial men. Presumably you are bound to have a provincial boundary. We are only concerned, at present and in the near future, with trying to place a reasonably high standard of pure American cotton on the market in the Punjab. It must be left to the purchasers to arrange the rest. The inspectors will be paid by co-operative societies. We are just beginning to help in regard to the distribution of seed. Wherever we have a strong society we are trying to persuade the whole village to sow nothing but American cotton 4F and Pusa No. 12 wheat. We have succeeded to a great extent.

865. (*President.*)—We are trying to take up this question of seed by having seed godowns attached to societies. We have our ordinary banking unions and they are going to have seed godowns at the headquarters of the union. I am not quite sure whether the Co-operative Department has commenced registering seed unions in the Central Provinces. I think some of them are registered.

Major VANRENEN of Renala Khurd, Montgomery District.

EXAMINED AT LAHORE, JANUARY 10TH, 1918.

(*No written statement was submitted by the witness.*)

866. (*Mr. Henderson.*) I have been growing 4F cotton for the last four years. The average yield is about seven maunds an acre. At present prices, it is very much more paying than wheat. I do not think that I shall be able to increase the area under cotton much more than at present. The necessity for maintaining rotations is the limiting factor. I have got 7,500 acres permanently and 6,000 acres on a three years' lease. About 2,000 acres of the permanent land are under wheat and 1,700 acres under cotton. These areas could not be altered very much. I have only just taken over the 6,000 acres. Wheat and cotton are my main crops. I grow leguminous crops. I have gram on 500 acres with a view to sowing cotton after it. Of the 7,500 acres 6,000 are cultivated by tenants and I am farming 1,500 myself. I have no difficulty in getting labour and tenants as a rule, but there is some difficulty in getting labour at present. I have to import labour from the Gujrat district which has been supplying a large number of recruits to the army and consequently labour is getting scarce.

867. The staple of 4F is longer than it was four years ago, particularly this year. I have had no trials with any other variety. The tenants consider 4F hardier than *deshi*. It is not so liable to disease and it is not so affected by excessive rainfall but the objection to it is that it matures so late and that it is difficult to sow it early on account of the lack of water during March and April. It takes longer to mature than *deshi* and the yield is reduced if it is sown late. *Deshi* will stand being sown late. If *deshi* were sown early, it might be an advantage to a certain extent: the picking season would be earlier. This year I had only 150 acres on my estate as compared with 1,600 acres of American.

868. (*Mr. Wadia.*) I have been selling my cotton for the last two years at the auctions held by the Agricultural Department but we are now starting a co-operative agency for selling our produce and are going to hold an auction on the 21st of this month at Okara. I sold 2,000 maunds of my cotton at the last Government auction at Rs. 20 per maund and I hope to get even better prices at the coming auction. Cotton pays much better than wheat at this price. At this price the outturn is worth Rs. 140 an acre as against Rs. 60 to Rs. 80 an acre for wheat. Our co-operative association is not registered. I am drafting the by-laws now and we hope to get it registered very shortly.

869. If the market value of cotton fell to Rs. 10 and the price of wheat fell to Rs. 3 a maund, it would still be advantageous to grow cotton. The cotton would be worth about Rs. 70 an acre and the wheat about Rs. 45 to Rs. 65 an acre. I would still prefer to grow cotton. The tenants prefer to grow wheat because it is a more reliable crop to grow, and is not so susceptible to damage. They also obtain a certain amount of food stuff for their cattle in the shape of *bhusa* (stalks used for fodder). They have not yet come to realize the benefit of growing cotton as owing to selling it to the village *banias* they never realize the full value. The village *bania* is cutting down the price in a shameless manner. If the co-operative society that we propose is started, that difficulty will be obviated. The tenants would come into it as we are establishing this agency for ourselves and our tenants.

870. There is a difficulty about getting water for early waterings. During the sowing season last April, we were unable to get any water at all for preparing the land for sowing and the winter rains had failed. The consequence was that we were not able to sow American cotton at all until after the wheat had been harvested. The cotton suffered on that account and matured very late. This year's crop is four maunds per acre on an average against the usual average of seven maunds. The late rains damaged it as well but the late sowing was more responsible for the short outturn. The canal supplies were very short in the spring of 1917. The

river was exceptionally low All that the Canal Department could do was to supply sufficient water for ... wheat and other winter crops

... the cotton ginned locally and ... There are two ... y own and I also ... ry great ... approximately ... tenants shares ... ther big estates ... be about 4 000

... always greater after a good monsoon I have a ... owing to military du...

400 to 500 ... American ...

themselves

Mr H. T. CONVILLE, Zamindar, Montgomery

EXAMINED AT LAHORE, JANUARY 10TH, 1918.

Written statement

I —AGRICULTURAL EXPERIENCE

... cotton

Short staple *deshi*, known as *thillar*, ... and "*Hansi*" and long staple exotic cotton, 4F American, in which is included ...

878 (3) (12) and (22) **Size of holdings** —The average size of holdings in well lands is about six acres and in irrigated lands about twelve acres, and the proportion of the holding under cotton is about two ...

... *deshi*, and long staple *deshi* yield little more than the profit ...

883 (17) and (27) **Prevention of mixing** ... of the different varieties is—

In the field by a careful plant selection by each individual cultivator, so that he may have sufficient ... season for his own requirements

... the selection of their

884 (28) **Importation of seed.**—I am of opinion ... preferable to seed imported direct from either America or Egypt

885 (8) and (18). **Uses of seed and seed selection.**—Seed is generally used for the feeding of cattle.

(2) The system of seed selection among intelligent cultivators at present is, that they select only *phut* or large *kapas*, regardless of any type variety and this is done in their godowns and not in the field, whereas plant selection in the field is absolutely necessary and the only means of keeping up types true to variety.

(3) Seed is usually hand-ginned, which is required for sowing purposes.

(4) The careless or unintelligent cultivator pays no attention to type or selection and merely sows what he can buy from the local *bania*. This seed may be any type or variety and not necessarily hand-ginned.

II.—COMMERCIAL ASPECT.

886 (30) **Local trade customs.**—The usual custom is for the cultivator to sell his *kapas* to the village *bania*, who has very often already advanced him money. This *kapas*, if carelessly picked, will contain a good portion of peppery leaf, especially of a dark colour, which is a great drawback. If pickers could be taught to pick out the lint from the plant neatly, avoiding as much as possible to touch the dry chalice, which crumples under the slightest touch, much would be gained. Cultivators should learn not to leave *kapas* on the plant until it drops and gets dirty on the ground, but always pick it from the plant. Clean cotton commands a premium in the market, which certainly makes it worth while to bestow a little extra trouble on the picking.

(2) The *bania* then sells his *kapas* to an *aratya* in the *mandi*. This *kapas* is not necessarily the pure variety he purchased from the cultivator, as he mixes all good and damaged *kapas* and some also increase the weight by damping the *kapas*.

(3) The *mandi aratya* then sells his *kapas* to the ginning factory, where also good and damaged *kapas* are mixed up indiscriminately, thus producing a cotton well spotted with yellow stains, one of the most conspicuous drawbacks of Punjab cottons. It is in the interest of the ginner and the cotton trade generally, if the ginner would gin good and damaged *kapas* separately, as is done in some provinces. The ginner should also learn to prevent the unusually large percentages of seed which is allowed to go into the ginned cotton. Another defect tending in this direction is the damping of cotton.

(4) The exporters' agents or the spinners' agents then purchase ginned cotton from the ginning factory and endeavour to purchase on type or class, suitable for their requirements. Exporters' agents and spinners' agents are now also purchasing *kapas* direct in *mandis* and having it ginned at factories, which they have leased.

(5) The Department of Agriculture has assisted considerably in helping these buyers to obtain pure and good types of 4 F American but there are still some buyers, who not only mix all classes of American, but are also mixing with their American, good percentages of *deshi*. I am of opinion that, if spinners were to be very strict in accepting all cotton tendered and penalising all mixtures and inferior qualities, the buyer, the ginner, the middle-man and the cultivator would naturally regulate their respective interests, by being more particular in the handling of all cottons. Under present conditions, there are too many middle men between the cultivator and the spinner, who are all out to make their profits and when such profits are not legitimate, it tends to depreciate the quality of all cotton handled.

887 (31) **Standardization of commercial names.**—The cottons from Multan, Lyallpur and Montgomery are known as Sind Punjab, Bengals and American Dharwars. Each type consists of grade known as "extra fine," "fine," "fully good" to "fine" and "fully good." This classification is suitable, provided these grades were standardized as is the custom in the Bombay Presidency.

III.—STATISTICAL.

888 (33) **Improvement of cotton forecast.**—Government forecasts are not quite satisfactory considering that such forecasts are made up from statistics provided by subordinate officials, who are not fully acquainted with a complete knowledge of the appraising of crops, hence it is very necessary that cotton press returns should also be published regularly.

889 (35) **Publication of Liverpool and Bombay prices.**—The publication of Bombay cotton prices is an advantage to the cotton trade.

IV.—GENERAL.

890 (46) **Attitude of buyers to improved cottons.**—I am of opinion that buyers generally do encourage the growth of improved cotton, by paying a premium for them, but there are also some buyers who, when the opportunity affords itself, combine and offer no premiums.

891 (47) **Effect of water rate.**—The water rate has effect on cultivators' preference for growing either wheat or cotton in preference to either rice or sugarcane.

892 (49) **Effect of tenure of land.**—The tenure, on which land is held at present, has the tendency to affect the extension of cotton cultivation.

MR. H. T. CONVILLE called and examined.

893. (*Mr. Henderson.*) My cotton has turned out very poor this year owing to its being badly affected by late rain and untimely water at the time of sowing. The yield is only 4½ maunds to the acre. That is 3½ maunds less than the average of other years. I had 900 acres under cotton, and 850 under wheat. That is roughly the proportion that intend to keep if I can do so. The total size of my estate is 3,000 acres. There are other crops as well, *e.g.*, maize, *toria* and fodder crops. There are 200 to 400 acres of other crops. I do not consider the rotation of wheat with cotton a good one. I would suggest the rotation of wheat, *toria* and cotton. That is the rotation I am going on with. At the outset I tried wheat and cotton but found that wheat, *toria* and cotton gave better results. There was no timely water in the canal last year. When water is late, wheat harvesting clashes with the sowing of cotton. We are busy threshing wheat and so have to sow cotton late.

894. I have considered the feasibility of having small threshing machines and intend to take them up. I have some experience of Marshall's threshing machines. There is a future for them in the Punjab but not on small holdings. Implements are very essential and have been taken up by people who have once come in contact with them. The most important implement in the Punjab is the Raja plough. Although the price

Rs 27 has gone up to Rs 30 owing to the war, it has been proved by my own experience, and

cultivators is at present out of the question

I have mentioned absolutely possible This could be done by the following method:—

of supplying an amount of seed

amongst the villages, each village

that village This should be given

controlled by Government but may be

measurements there are about 16,000

is impossible for the Agricultural Department

It is only possible for the Agricultural

in the Lower Bari Doab Canal, in order

kapas Taking the yield roughly at even

area necessary to produce that amount

the same

time for harvesting crops except from

ance to *zamindars.* The majority of the

tures in order to raise money to meet their

true in present conditions It is merely a question

900. *As to yield,* American cotton yields better than *deshi.* This year the yield of *deshi* was half that of American. I am of opinion that the damage to American this year was eight annas and that to *deshi* was

cotton in the Punjab when I was with Messrs. Volkarts.

at the greatest difficulty that one had to contend

which I mean that a man buys an article of which

ably pays a better price for that quality merely to

a matter of fact, up till five years ago, buying up

Bombay exporter or seller to the spinner took his

agent upcountry simply bought the quality in that

district. The orders he received merely were "Buy Lyallpur cotton" or "Buy Multan cotton." Those particular stations were famous for certain types which the more experienced buyer knew. With the closer competition from Germany and Japan, the prices became very fine, and the exporter had to do upcountry what he used to do at Bombay or Karachi. The agents of the buyers in the Punjab were given orders to buy at certain rates for certain classes at certain places. That is, supposing a man was given orders to buy Lyallpur cotton or Lahore cotton at a rate of Rs. 20, he was empowered to pay say Rs. 20-8-0 for extra fine quality, Rs. 20 for fine, and Rs. 19-8-0 for fully good quality. The ginneries had no idea of classification. They simply bought *kapas* and ginned it, but when they found that buyers were paying a premium for Multan and Lyallpur cotton as compared with Amritsar, they naturally found that it paid them to introduce *kapas* from intermediate stations and take it to Multan. The result was that Multan cotton, which had a very great reputation twenty years ago and up to say about eight years ago, has now not the same quality as it is all mixed. Yet there are buyers who come along even now and go by what happened in the old days. In trying to find out the quality of the cotton, three or four firms burnt their fingers very badly and have gone away. The result was that firms who knew their business well, Messrs. Rallis and Volkarts, could buy the genuine article on a standard against ignorant buyers who did not understand the quality. There has been a considerable improvement in recent years.. There is now a premium for quality: there is a premium also for staple. It was not so formerly. Messrs Volkart Bros. buy on class, otherwise they could not be in the market. Anywhere staple is found, you will find that Messrs. Volkarts and Rallis will pay a premium for it. Peshawar cotton, for instance, commands a better price on account of its staple, as also the cotton from Dera Ghazi Khan. Messrs. Volkart Bros. sell at home on arbitration. Owing to this premium on class and staple, there has been a distinct improvement in the quality of the cotton shipped from the Punjab. In my opinion, it would be a good thing if spinners were to be very strict in accepting all cotton tendered and in penalising all mixtures and inferior qualities. This naturally would affect, the ginner, *zamindar* and the buyer. What I mean to convey is this that, at the present moment there are great complaints from the Lancashire and the Bombay people that the Punjab cotton contains a certain amount of mixed qualities. Those qualities are mixed but still they have an outlet and are still sold in Bombay. If *A* does not buy, *B* will and if *B* will not, *C* will, but if *A*, *B*, and *C* were not to buy it, the producer and the ginner would not have an outlet. As long as they find there is a market for mixtures, they will keep on mixing. The only remedy that can be suggested is to alter the conditions under which they work in Bombay. All cotton should be seen and should be sold on that basis if that could possibly be arranged.

902. I have seen the ginning factories at Chichawatni and at Okara. These factories, which are now being put up, are most suitable and are on the lines on which ginning ought to be done. In old factories, the platforms are narrow and the width between the gins is very limited. There is only one outlet and one inlet. Seed cotton comes in by the same door as the ginned cotton goes out. The result is that the *kapas* falls on the ground and the man taking out the ginned cotton picks it up. In the new factories, the entrance and exit are distinct and wide apart. They are a decided improvement on the old ones.

903. (*Mr. Wadia.*) I have not been in touch with the Bombay rules for a number of years. The old Rs. 5 allowance rule still holds good. I have seen cotton which as a buyer I would not have accepted with Rs. 10 allowance. That cotton has been sent to Bombay and has been passed. A certain agent bought some cotton of mine which I would consider as Rs. 10 fully "off." He told me that he had to fulfil his contract or otherwise pay a considerable difference. He sent the cotton down to Bombay, paid an allowance of Rs. 4 and had it passed. I have always been under the impression that Punjab-American fetches Rs. 30 above Broach. The only quotation of Punjab-American I received from my agent in Bombay was Rs. 30 over Broach. Broach at that time was Rs. 600. I have not heard of any actual transactions lately.

904. As to the method by which 4F can be marketed in Bombay, I would suggest that there should be some standardisation. There should be some system by which a particular mark should be established for this particular type as suggested by Mr. Calvert and that mark should be worked on. It could be done only if buyers in Bombay would pay for that mark.

905. Now that the Agricultural Department has got pure cotton two or three buyers come up and combine and think that is fair to producer and organizer. Bombay does not encourage the producer to produce superior cotton. At the first auction that was held in the Punjab, the buyers did not pay any premium. If Messrs. Rallis and Volkarts were to pay a premium, the other buyers would wake up. Rallis' and Volkarts' quotations in Bombay are always higher than those in the Bombay market. Punjab-American is quoted at Bombay but if you go to Rallis and Volkarts, you will find that they are asking Rs. 5 or Rs 10 higher. They take an average sample. They cannot depend on what they get out of the ginners and so they work on lines of their own The whole fault is that of the ginners. I think the ginners are very much to blame. When Rallis and Volkarts buy from ginners, they do not get pure stuff. If a ginner finds a firm coming along and paying a price which is higher than he can pay, it is natural that he should refuse to gin for it and allow it to put money into its pockets. In both cases it is a question of self interest. As to a way of meeting the situation, I should say first that there are a considerable number of middlemen between the purchaser and the spinner. I think the spinner would pay a proper price if he could get his quality. The producer would produce the best cotton if there were a demand for it. My idea is that if it were possible for Government to have ginneries at convenient centres, to which the cultivator might simply bring his cotton to have it ginned, that would be a great advantage. There are more buyers of ginned cotton than of *kapas*. As to the argument that Government are not traders, I would point out that they sell canal water and I do not see why they cannot establish ginning factories and sell ginned cotton. It depends entirely where you differentiate between trading and helping an industry.

906. I tried experiments with Cambodia but it was a failure. I think it was not suitable for the Punjab. It must be sown early. I think it goes on much later than other cottons and that the cold affects it.

907. I would suggest licensing of ginneries by law to stop pools. I put in my evidence before the Industrial Commission on this point. Pools as existing at present are detrimental to the interests of the industry in general and I think that they should be discouraged. I would have no objection to making it a condition of the license that the number of factories in each district should be dependent on the amount of cotton available. For instance, take the case of Multan, where the total crop is enough for four or five factories, but where there are at present 42 ginning factories. Eight are actually working when there is sufficient work. There are 34 factories lying idle. They simply exist for sharing in the profits of the pool. The machineries and the factories are lying idle. They might be utilised for other purposes or for other industries. As to whether some concessions might be given to the factory owners to remove their factories

to places where they are really required, I think that a good number of them would be prepared to have their factories valued and sold because there is always a chance that a pool may not last The factory owners might sell to
could sell the
purchased.

slight improvement in the ginning percentage of the cotton The pickers in order to increase their share pick up this cotton, throw it in with the rest of their pickings to get a bigger weight Some of it goes to market.

Annexure

Written Evidence of Mr H T Conville before the Industrial Commission

910 *Preamble* —I desire to give evidence on—

(1) The agricultural industry and (2) The cotton ginning and pressing industry only

prices

of Government and create a demand for trained men So far as the men are concerned the various districts might be manned gradually in accordance with the men available and as regards the increased expenditure Government will be compensated by increased revenue when outturn and qualities are improved and better prices obtained

the special ginning of long staple cotton, not only by way of demonstration, but in the interests of the industry itself, such factories could be handed over to private capitalists or companies, when Government was satisfied that the system of ginning had been established and that the industry itself would in no way suffer.

Maulvi FATEH-UD-DIN, B.A., Officiating Deputy Director of Agriculture, Punjab.

EXAMINED AT LYALLPUR JANUARY 11TH, 1918.

Written statement.

AGRICULTURAL EXPERIENCE.

(a) "Desi" short staple cotton

913. **(1) Experience.** I am supposed to be in charge of the most of the districts of the province, but agricultural work of any importance is going on in only seven of them. I shall accordingly deal in these notes with seven districts only as I have been in actual touch with the cultivators in these places for over six years. These are :—

(i) Hoshiarpur, (ii) Jullundur, (iii) Gurdaspur, (iv) Amritsar, (v) Sialkot, (vi) Gujrat, (vii) Shahpur.

All these grow cotton but excepting the district of Shahpur, the Taran Taran *tahsil* of the Amritsar district and part of the Gujrat district which has only recently come under the Upper Jhelum Canal, this crop is not of very great importance and is grown more or less for local consumption.

914. **(2) Varieties.**—In these districts, *Gossypium indicum*, *Gossypium neglectum* and *Gossypium sanguineum* varieties are grown, but nowhere is a pure crop of any of these seen. They are always found in mixtures though a certain variety predominates in certain parts and the other in other places. *Gossypium indicum* is perhaps more extensively grown than any other. Nos. 1 and 2 are largely grown in the central districts of the province and Nos. 1 and 3 in the western districts.

915. **(3) Size of holdings.**—The size of holdings vary in various districts. In the central districts (Hoshiarpur, Jullundur, Gurdaspur, Amritsar and Sialkot) the holdings are not very large and vary between three acres in Jullundur to six acres in the Sialkot and Amritsar districts and one hundred and fifty acres in greater part of the Shahpur district, but the average area per plough would be eight acres in the central districts and fourteen in the Shahpur district. Of this, in places where cotton is grown, it forms not more than only one-sixteenth of this acreage in the central districts and one-tenth in the Shahpur district.

916. **(4) and (6) Yields and profits and comparative returns.**—The outturn per acre also varies from 2½ maunds in the *barani* of the Gurdaspur and Gujrat districts to seven maunds in the irrigated areas of the Sialkot and Amritsar districts. In almost all these districts cotton is generally grown in mixture with *moth* (*Phaseolus aconitifolius*), *guara* (*Cyamopsis psoralioides*), melons, etc., and in *barani* areas ratoon crops are also taken. It is, therefore, rather difficult to work out very definite figures of profit per acre from this crop alone and also no accurate estimate could be made of cultivators' own labour; for his daily wages are only what he eats which is nearly three annas a day. The profits per acre are, therefore, very rough estimates and vary from Rs. 6 per acre in the *barani* areas to Rs. 21 in the irrigated areas. This compare with the other main crops of the same districts in the profits per acre as follows :—

	Rs.
Rice	6 profit per acre
Wheat (irrigated)	20 ,, ,, ,,
Wheat (*barani*)	6 ,, ,, ,,
Sugarcane	30 ,, ,, ,,
Maize.	20 ,, ,, ,,

It will be seen, therefore, that cotton is not so very paying a crop in these district as compared with other staple crops, for they not only give the cultivator grain to eat but also provide fodder for cattle and except sugarcane appeal to him in quick returns.

917. **(5) Rotation and manures.**—Manures are seldom applied to cotton. The residual effects of manures applied to sugarcane and residue of *senji* are the only manuring done to it. In some places cattle are penned in cotton fields and very often *senji* is fed in the very fields, where it is grown, and this goes under cotton afterwards.

(2) Owing to paucity of holdings, no fixed rotation is practised; for the *zamindars* look to the season, *i.e.*, if it is favourable or not for certain crops at their sowing time, market demand and their own convenience to grow any particular crop. An idea of the sequence of the crops is below :—

Irrigated areas :—

(*a*) Wheat, cotton, *senji*, sugarcane.
(*b*) Cotton, *senji*, maize, wheat.
(*c*) Cotton, *senji*, sugarcane.
(*d*) Maize, *senji*, sugarcane, wheat, cotton, *senji*.

Barani areas :—

(*a*) Cotton, cotton.
(*b*) Wheat, fallow, cotton.
(*c*) Maize, fallow, cotton.
(*d*) Ratoon cottons.

918. **(7) Conditions affecting increase in area.**—The area under this cotton in these districts fluctuates considerably owing to the variations in the season, the market prices and any unusual attacks of pests; *e.g.*, in 1914 there were early rains in March and April and the prices the year before were good; the area under cotton in Amritsar district in that year was over 67,000 acres. But, when this crop ripened, the market was low, there were no early rains and consequently the area in that district in 1915 went down

to 24,700 acres.
in 1916 went up
fell from 54,526
in the Jullundur
and the area in 1
the area again rose to 39,382 acres

(2) There is no possibility of any increase in the area under *deshi* short staple cotton in the central districts except perhaps the Tarn Taran *tehsil* of the Amritsar district. I, however, think that in these districts, even including the Tarn Taran *tehsil*, there is every likelihood of cotton decreasing considerably

(b) "*Deshi*" *long staple cotton*

920. (11) Varieties.—No long staple *deshi* cotton is grown in this province.

(c) *Exotic cotton.*

922 (21) Varieties.—The American variety only of exotic cottons is grown here. Of this the seed ... s the Dharwar American ... The last named is found

(i) *Barani* areas,—where no cotton is grown.
(ii) Old *abadi*,—partly irrigated by wells and private canals and partly by the Government inundation and perennial canals.
(iii) New *abadi* (colony) irrigated by Lower Jhelum Canal.

grown and very little American. The reason is that on the inundation canals water is not available at sowing time and also in October. Cotton here is generally sown late and follows wheat. Secondly, the tenants there are very conservative and not very sportive. They are far away from any ginning factory and cotton market and are quite content to go on as they have been doing in the past. Further and it is very important with them that they keep a large number of milch cattle and should, therefore, have a lot of

are cavalry breeding farms, these could very well serve this purpose, if put in charge of departmental trained men instead of having an Indian officer of the cavalry who knows little about cultivation and perhaps as little about horse breeding. An experienced Agricultural Assistant with Veterinary Assistant to help him in breeding, as he does at present on these farms, could do the same work more efficiently besides supplying the neighbourhood with good seed and demonstrating better methods of cultivation and tillage.

926. (23) **Comparative returns.**—The average yield of American cotton in this colony is $4\frac{1}{2}$ maunds per acre. Taking an average of the last five years' prices, the price per maund comes to Rs. 12. This means Rs. 54 gross income. The cost of cultivation is roughly Rs. 24. The profit per acre comes to Rs. 30. The *deshi* cotton on an average gives four maunds per acre. The price of this cotton for the last five years on an average has been Rs. 8 per maund. The gross income from an acre is Rs. 32. The cost of cultivation is less and can be put at Rs. 20. The profit per acre is therefore Rs. 12. The most important crop in this tract is wheat which yields on an average thirteen maunds. The prices are generally Rs. 3-4-0 per maund and taking Rs. 5 as price of *bhusa* per acre, it gives Rs. 47-4-0 per acre. The cost of production is Rs. 28, and the profit per acre is Rs. 19-4-0 (the price of *bhusa* has gone up considerably recently).

927. (24) **Rotations and manures.**—The rotations followed are:—

(a) Wheat, wheat, *toria* or turnips, cotton.
(b) Wheat, *toria* or turnips, cotton.
(c) Wheat, *toria* or turnips, cotton, sugarcane.
(d) Wheat, *bajra* or *juar* or *gwara*, cotton.
Nos. (a) and (b) are the common rotations.

(2) Manure is rarely applied. The previous crop of turnips is generally manured or where cotton follows sugarcane, it gets the residual effects of heavy manuring to that crop.

928. (25) **Conditions affecting increase in area.**—If plenty of water is available in March and April and also in September and October, the area under cotton will go up by another ten per cent. without any serious competition with food crops: the increase in the area under American cotton will affect *toria* sugarcane, wheat, melons and early fodders. I do not think the area will ever go up any more than this; for

(i) Canal Department guarantees 25 per cent of *kharif*.
(ii) The increase will affect other crops.
(iii) It is more or less a speculative and not a very sure crop.
(iv) The cultivator must have at least forty per cent. of his area under wheat, which is more sure as a crop and provides him with grain for his own consumption and fodder for his live stock, also he must have at least sixteen per cent. under fodder crops, especially in this colony, where a mare must be kept as a condition of tenure, and where also the cultivator looks upon his cattle, more especially milch cattle as a great asset. The rising prices of *ghee* are also another inducement to these people to grow more fodder to keep more milch cattle, especially buffaloes.

929. (26) **Suitability of existing varieties.**—I think the 4 F. type of American cotton, the cultivation of which this Department is at present pushing on, is so far the right variety to be spread. But futurity might produce any better types or varieties for future introduction. The Economic Botanist must continue his work of breeding, hybridisation and selection. The last must also be in progress at experimental stations. The selection work is as important or even more in the improvement of plant in cotton as anything else.

930. (27) **Prevention of mixing of different varieties.**—Growers have come to realize the value of bringing pure stuff in the market by the better prices they get for it and no intentional mixing is ever done by them. All the same, some *deshi* plants do find their way into American cotton fields. The reason is that *zamindars* do grow and will continue to grow for some time to come some *deshi* cotton for their own use and if the pickings and storing have not been carefully done, some mixing takes place. But there are a few places where no other cotton except American is grown. Mixtures in such places come from the seed. The mixing in the field can be stopped by supply of pure seed from any agency supervised by the Department. The supply of pure seed will remove largely this complaint about mixing in the field. There should also be enough supervising staff, who should take upon them to get *deshi* plants rogued out from the fields of American cotton. This will have to be done for a few years only.

(2) The establishment of seed farm in each locality and seed agencies managed by co-operative credit societies would help to stop mixing in the field, for few growers will select their own seed in the case of American cotton as they do with *deshi*. The reason is that the lint of the American cotton is no use to them. It can not be spun and handled in the local method. It pays the grower even to buy *deshi* cotton for his own use and sell his American.

(3) I think that buyers also can help a good deal to stop this mixing in the field if they would pay better prices for pure stuff and fix their prices according to impurity percentage. They don't make much difference up to five per cent if the quality is good.

(4) The mixing in the factory can only be stopped by legislation and having separate ginning factories for *deshi* and American cotton.

931. (28) **Importation of seed.**—So far this is a moot point. Seed should, however, be imported from America and acclimatised at the Government central farms and compared with the seed at present recommended for distribution. So far there are no evident signs of degeneration in the seed; but later on it may appear necessary to import fresh blood to keep up the strain. Selection of seed, of course, is very necessary every year and this should be continued on Government farms.

II.—COMMERCIAL ASPECT.

932. (30) **Local trade customs.**—The cultivator has seldom a free hand with his produce. In nine cases out of every ten, he is under obligation to somebody, the village *bania*, the commission agent, etc., etc. His produce, therefore, naturally goes to his creditors in most cases. Most of the *kapas* in villages at a distance from market places is bought by the village *bania* or through him. I have collected some figures of cotton coming to the market in November and December this year. Over 85 per cent. of the *kapas* that came into Sargodha belonged to the village *banias*.

(2) Those who are near big towns owe something to commission agents and their produce passes through the latter's hands. There are very few to go to a factory direct.

(3) In the Jhelum Colony, forward contracts are not an uncommon thing Sometimes standing crops are *sold*, which is a more speculative form of buying cotton than the other in which a grower agrees to sell to a buyer all his produce of cotton at a rate [illegible]

[illegible] is especially the case when a factory owner has also a commission agency. The exporting firms too buy in the villages.

933 (32) Buying agencies —*It is very difficult to decide upon any form of buying agency.* The *zamindar* wants money at once and whosoever gives him least trouble [illegible]

[illegible] in every village, I think the grower will always manage to sell his stuff at a good price in the market without any special form of buying agency as long as he can learn the ruling market rate.

III —STATISTICAL

934. (35) Publication of Liverpool and Bombay prices —The daily publication of Liverpool and Bombay prices is very useful, as it gives the sellers an idea of the ruling market rates These publications should be more widely circulated

IV —GENERAL

935 (46) Attitude of buyers to improved cottons.—The buyers have been offering a premium for improved cottons but not as much as they should do They have been keeping a greater margin of profits for themselves as is apparent by the auctions the Department holds annually at various places, where prices [illegible] 'e had to be introduced owing

[illegible] reeding condition on which the land is held affects the extension of American cotton The area under fodder otherwise would surely go under cotton

Maulvi FATEH UD DIN called and examined.

[illegible]

938. We are following the usual rotation, i e , wheat, *toria*, cotton, wheat, wheat, *toria*, cotton *If people* were to leave out *toria*, they would get better yields but it pays them to grow *toria* and it is not on the ground for a long time The yields could be increased by a couple of maunds if *toria* were left out. *Toria* gives on an average ten maunds to the acre and it fetches from Rs 4 to Rs 5 per maund So an acre pays at least from Rs 40 to Rs 50. I do not advocate it but the people prefer to grow it and will continue to do so, because it pays them. [illegible]

[illegible] under American cotton for next year but I expect that it will be between 65,000 to 75,000 acres. The seed we expect to sell will grow about 50,000 acres. The arrangement we made last season in regard to our seed was this. The A class cotton was sold to Messrs. Tata and Sons on the condition that they should keep it separate from the remainder and that it should be ginned under departmental supervision and the seed given back to us. The seed was good and the germination quite satisfactory The five thousand maunds

of seed I mentioned includes the seed for the Upper Jhelum Colony also. There were only 1,000 acres under 4 F. in the Upper Jhelum Colony last year. I cannot give the estimate of the area that will be put under cotton next year, but a greater part of the cotton area in that colony on that canal would be under American cotton. A good many people on the Upper Jhelum Canal have come from the Sargodha Colony and they will all grow American cotton.

942. My estimate of the yield of American cotton in the Lower Jhelum Colony this year is 4½ maunds. That for *deshi* is less, about three maunds. *Deshi* has suffered much more than American. I formed this estimate after the sales in December. The outturn in the Lower Jhelum Colony is rather poor in comparison with Lyallpur and other places. The cultivation is poor and a mixed crop is almost always grown. Cotton is grown mixed with fodder and I have seen even American cotton grown in mixture with fodders.

943. If enough water were given in February, it would be used for preparing land for sugarcane and cotton. The area under both would go up. For sugarcane, water is wanted in the end of February. On inundation canals, if we got water in the beginning of April, it would do for American cotton. Almost all the land on the Lower Jhelum is given out on horse breeding conditions. I think that if the cultivators get more water in *Kharif*, the conditions would improve in regard to the growing of fodders. *Jowar* in *Kharif* and *shaftal* in *rabi* would be grown.

944. It would be a good thing to have Agricultural Assistants in charge of the Cavalry farms on the Lower Jhelum Canal. The farms would then be able to influence a wide area; and would serve as a sort of seed farm. The people, who are just round about Sargodha, are taking an interest in cultivation because they have got some confidence in us and we have thus a sort of influence over them and also the presence of the seed farm helps by offering a practical demonstration of what can be done. Further away the cultivation is bad.

945. I am supposed to be in charge of 22 districts in the province. There are 29 districts in all. I have got one experimental farm at Gurdaspur, one seed farm at Sargodha, three demonstration farms, one in Sialkot, one in Amritsar and one in Gujrat. There is also a seed farm at [illegible] in the Gujrat district. In addition, agricultural work is going on in the Jullundur and Hoshiarpur districts. I have got six assistants in these districts — two under District Boards and four under the Department, and one Farm Manager. So that, out of 22 districts, sixteen have no staff at all. Sargodha, I visit once a month. I often visit six of these districts. I am on tour over 200 days in the year.

946. In the central districts, the cultivators prefer wheat and sugarcane to cotton. In fact, in all the districts they prefer wheat to cotton.

947. Insect pests have not been a serious pest lately. Boll-worm is a serious pest occasionally. There may be a danger of its appearance this year as the winter was very mild. The boll-worm parasite is killed in such a cold season.

948. There should be at least one seed farm in each district on which improved methods of agriculture would also be demonstrated. I am also in favour of a private ginning on these seed farms. The best prices for cotton can be obtained at the auctions when there is competition. We shall secure control of the seed as well as give the cultivators an idea of what the prices that year are. I cannot say whether private enterprise will take the place of this in course of time. I am not hopeful about it. Perhaps it would be better if the co-operative movement were to take it over.

949. (*Mr. Wadia.*) There are some tracts where people will continue growing *deshi* cotton, i.e., (1) on the inundation canals, (2) on wells in the central districts where cotton follows wheat. In some districts, there are tracts which are far away from the large centres and the people do not know about prices and are in the hands of the village *banias*. They grow fodder mixed with cotton, and are quite content to get two or three maunds of cotton. They cannot grow a good fodder crop with American but they can with *deshi*.

950. (*Mr. Hodgkinson.*) The harvesting of wheat does not interfere at all with the sowing of cotton. Most of the cotton is sown before wheat is harvested. Cotton is sown from the 15th March to about the end of April. Wheat harvesting begins about the 15th April. That even would be early wheat and people really begin about the 20th. Only a small proportion of cotton is sown in lines at present. I am advocating sowing in lines and think this practice will be taken up very largely next year. Some *deshi* cotton is also sown after wheat is harvested. The ordinary period for sowing *deshi* is the same as that for American but it can be sown later whereas American cannot.

951. (*Mr. Ashton.*) I cannot say what the demand is in *Kharif* compared with the capacity of the canal. The people generally complain that they do not get enough water to irrigate their crops.

Mr. O. T. FAULKNER, Deputy Director of Agriculture, Lyallpur.

EXAMINED AT LYALLPUR, JANUARY 11TH, 1918.

Written statement.

952. *History of introduction of American cotton in the Punjab.*—Although some previous attempts had been made, the history of the introduction of American cotton in the Punjab really starts with the experiments initiated at Hissar at the instance of Mr. Mollison, then Agricultural Adviser to the Government of India, in 1902, and subsequently transferred to Lyallpur. From that date the work has been more or less consecutive and can be followed in departmental files so far as the efforts of the Agricultural Department are concerned. This is unfortunately not the case with regard to the even more interesting spread of this cotton in certain parts of the Canal Colonies—notably Jhang—apart from the efforts of the Agricultural Department And for information on the point I have been able to rely on nothing more than enquiries made by our assistants among old *zamindars*.

(2) It appears that prior to the colonization in the new canals (*i.e.*, before 1895), acclimatized American cotton was growing, though generally much mixed with country varieties, in various "old" districts, notably Shahpur and Jullundur. Various colonists brought such seed with them, and the local *janglis* obtained it from these new settlers. It was chiefly in Jhang district that cotton crops were grown in which American constituted any large percentage, but such fields were extremely rare until after the bad "bollworm" years, 1905 and 1911. For a long while (probably up till about 1908) American *kapas* is said to have fetched a few annas less in the market than *deshi*.

system was free from the abuses of the previous one

(4) In 1910, seed, chiefly imported from Dharwar, was distributed by the Agricultural Department sufficient to sow about 1,000 acres and Mr. Milligan reported that the crop from local acclimatized seed in Jhang amounted to several thousand bales The more rapid spread of American cotton in Jhang where the cultivators received at most only indirect assistance from the Department's activities is worthy of note The reasons for this appear to have been:—

(1) In Jhang acclimatized and "naturally selected" seed was used whereas the Department was chiefly distributing the Dharwar American annually imported Many strains of this at least were unsuited to the Punjab

(2) In Jhang cotton was, and is the chief *kharif* crop (other than fodders) Hence the lesser susceptibility of "acclimatized" American cotton to vicissitudes of season and disease was more fully appreciated

(3) The somewhat greater demand of American cotton on the water supply did not greatly concern inhabitants of that district, who have always notoriously tended to over watering

(5) In 1911 and 1912, the Economic Botanist's selections were still under trial at the farm and Dharwar was still the chief source of the seed supplied to growers by the Agricultural Department In 1912, seed of

Year	Area	Authority	Estimated area under pure 4 F
1913	30,000	Mr A S Pearse's report	1,000
1914	60 000	Mr Roberts report, Agricultural Journal	3,000
1915	65,000	Mr Roberts' report, Agricultural Journal	9,000
1916	125 000	Irrigation Department returns and Mr Roberts' report	30,000
1917	277,000	Irrigation Department returns and Mr. Roberts report	At least 120,000

Year	Number of sales	Quantity of *kapas* sold	Premium over *desi*	Premium over American sold otherwise
			Rs A P Rs A P.	
1908-09	2	A few hundred maunds	1 5 0 to 1 9 0	Practically the same.
1909 10	2		1 6 0 to 1 8 0	Do
1910 11	2		...	...

Year.	Number of sales.	Quantity of *kapas* sold	Premium over *deshi*.	Premium over American sold otherwise.
1911-12 . . .	No sales held, factory owners gave about Rs. 1-0-0 per maund over *deshi*.			
1912-13 . . .				
			Rs. A. P.	Rs. A. P. Rs. A. P.
1913-14 . . .	1	950	2 13 0	1 8 0 to 2 0 0
1914-15 . . .	2	5,200	up to 3 13 0	About 2 0 0
1915-16 . . .	8	8,000	*up to 3 5 0*	" 2 0 0
1916-17 . . .	9	*48,000*	*4 0 0 to 7 0 0*	" *3 5 0*
1917-18 . . .	12 (?)	*(?) 80,000 to* 100,000	*4 0 0 to 5 0 0*	*1 0 0 to 3 0 0*

(8) The value of these sales to *zamindars* is shown by the fact that even this year here in Lyallpur, the pure American *kapas* in the auction fetched Rs. 1-4-0 more per maund than it would have done if sold in the ordinary way. *Actually this means even more than appears, as in the ordinary way of selling there are often* allowances and deductions obtained by the buyers and commission *agents, which are not always entirely* justified.

(9) *From the above history, it will be seen that rapid increase in area only occurred when the Department* was distributing a really safe type of seed and made such arrangements that the produce commanded a good premium. *In Jhang, the variety being grown was safe enough; but little or no premium was obtained for* it; consequently the cotton spread, but it spread slowly in spite of other favouring factors. In Lyallpur and Sargodha, although the auction sales enable the *kapas* to command a small premium, yet success was not attained until *the Department started distributing the selected type of acclimatized cotton.*

(10) In view of these facts and that we have now a successful variety, I think that we should not introduce *any new selection until it has been grown and tested for several years by the* Economic Botanist and for several more on the Farm. (The type No. 280 does now seem to have been tested nearly sufficiently and will, if it continues to do equally well, probably be distributed tentatively next year or the year after.)

953. *Further increases in production of American cotton.*—The spreading of American cotton up to the limits possible in the present Canal Colonies may be confidently expected to take place very quickly even *under existing conditions. The Agricultural Department in these colonies will need some expansion to deal* with this area satisfactorily but I think this expansion is expected and will be *provided for by Government.* Any further increases beyond this amount depend chiefly on the *Irrigation Department.* The Irrigation Department alone might bring about some increase in growing of staple cotton in such an area as south-east Punjab) Jullundur, Ludhiana, Karnal, etc), but I think that experiments there are necessary for three or four years before the Agricultural Department should attempt to push *American cotton* at all vigorously. In the most hopeful areas, where we know that agriculturally the crop is *a success, i.e., West Punjab, any* increase in area firstly depends on the Irrigation Department and only secondarily on the Agricultural Department. The role of the *Agricultural Department must chiefly be to help the people to take* advantage of improvements in water-supply during April—October. *On some inundation canal* areas, tube-wells or other improvements in lift irrigation may enable American cotton to be grown instead of *deshi*; *but I do not think that the Agricultural Department should encourage expenditure on tube-wells in areas where there* is a possibility of the inundation canals being greatly improved by weir headworks, etc.

(2) Increase in yield per acre depends mainly, I think, on the progress and expansion of the Agricultural Department.

954. *The improvement of the local marketing system.*—The auctions held by the Agricultural Department have been referred to. They have served :—

(1) to enable us to get back pure seed.

(2) *to command for the growers of the seed given out by us,* a premium more or less proportional to the value of the cotton.

(3) to advertise the American cotton and to some extent to establish its price for all growers. They will serve to the same extent for any new variety we *may subsequently introduce.* There are, however, elements of unsoundness in them and the Agricultural Department cannot greatly expand the scope of these sales *and it is doubtful if any other agency* could take them over. Lastly, they do not encourage any improvement apart from the introduction of new types by the Agricultural Department.

(2) *To keep the market as staple and sound as possible,* I think that we must chiefly trust to the presence of as many kinds of buyers of *kapas* in the market as possible. At present we have :—

(1) *the gin owners* who are also more or less speculators.

(2) exporters.

(3) representatives of Indian mills.

(3) Unfortunately owing to the fact that the latter two classes own no gins in the Chenab Colonies they buy little *kapas*.* I do not see that Government can do much more than allow any *exporters or mills who are willing to put up gins,* to do so. But this I think should be allowed even though there be already too many factories in the particular locality. Cheap *rates and specially quick booking* for unginned cotton would assist any such firms who put up factories.

(4) But really to encourage improvement is quality, differences in quality of our *kapas* need to get more recognition in the local markets than they do at present. Suppose two men should to-day bring American

* NOTE.—*Since drafting the above, the local agents for Messrs. Tata and Sons have purchased two factories in Lyallpur.*

cotton *lapas* into Lyallpur and the class and *lon* (ginning outturn) of the cotton in each case is average, but the staple in one case is so superior as to be worth say Rs. 15 per *khandi* more in Bombay than average Lyallpur American and the other so inferior as to be worth Rs 15 less. It is certain that the first man will not get Rs 8 per maund more for his *lapas* than the average. I do not think he would get any premium unless, possibly, he happened to be able to sell it to one of the exporting firms. The man with the [illegible] but it is impossible to say how much. The [illegible] large one, certainly if it is less than 1,000 [illegible] obtained from the local gin owners. This is [illegible] importance. More regard is certainly paid [illegible] *lapas* can often get the premium which it deserves.

(5) Some improvements in this respect may result from the setting up of gins by millowners and [illegible] in this respect, it will greatly assist us here in the Punjab. The Local Agricultural Department would naturally assist in any way that they could.

935. *Future fiscal policy.*—This is a matter which I allude to with extreme diffidence. But I note from the daily papers that some witnesses have already referred to it and this must be my justification for doing so. Since it is the Provincial Governments that are mainly concerned with agricultural production, whereas [illegible] arrange[illegible] empha[illegible] culture, [illegible] levied [illegible] [illegible]ers are [illegible] close touch with the local representatives of firms and so on, but it is difficult to get and keep touch with Indian and Bombay mills and the heads of exporting firms. I would suggest an annual cotton conference of three or four days duration, more or less on the lines of Board of Agriculture. The following I should like to see represented:—

(1) The Agricultural Department of each cotton growing province should be represented by the expert chiefly working on cotton.
(2) Representatives of Cotton Sections of Indian Chambers of Commerce.
(3) The exporting firms.
(4) Whenever possible, a representative of the British Cotton Growing Association.

The above would constitute the formal representatives who alone would be expected to speak; but anyone interested in cotton should be welcomed as a visitor. The subjects for discussion will be commercial aspects of cotton problems—scientific papers would not be needed. As usual, in such conferences, as much good may be expected to result from the informal meeting of representatives of the various interests as from the formal discussions.

Mr. O. T. Faulkner called and examined.

937. *(Mr. Henderson.)* As to what we are doing in regard to implements, we are not exactly strongly [illegible] we are endeavouring to produce a type better [illegible] implements for [illegible] which we are [illegible] We have been [illegible] chain harrows out; but they are too expensive to go very far. [illegible] Rs. 50 to Rs. 70 for any [illegible] general [illegible] that we [illegible] We have [illegible] we are not in a position to [illegible] [illegible] factor as regards the [illegible] a larger area under cotton [illegible] the extension [illegible] which are growing less [illegible] of wheat. [illegible] under wheat.

959. As to the yield of cotton this year, I think a figure of about five or five and a half maunds an acre is about right. Improvements in cultivation would mean a considerable increase in yield. The figure for the average of the district is always much lower than the yield of a good field; because there are so many fields and parts of fields which have little or nothing on them owing to *kalar*, bad levels, [illegible], late sowing, flooding or bad cultivation. As to the question of yield being reduced since [illegible] I should imagine that, in this colony, we have reached the limit of any deterioration if [illegible]. If any deterioration is now going on, it is extraordinarily slow. I do not think we are [illegible] with the present intensity. I hope to see a considerable improvement in the stand [illegible] round. The use of improved implements, sowing in lines and interculture would help a great deal.

960. I think there are considerable possibilities for green manuring in this province but there is a lot to be worked out about it. It is very largely a matter of water supply. I do not think green manuring would take the place of wheat. If more water is given in *kharif*, green crops might be grown in *rabi*, but they would mostly be fed to cattle. It is one means of increasing the fertility of the country. It is an extraordinarily big question which should be worked out. We have an intensity of something like one hundred per cent., and on many fields leguminous crops are seldom or never grown. Under these conditions, I think some leguminous crops could be introduced in the *kharif* season, if the water arrangements were such as to encourage the cultivators to do it. If the intensity is increased, I think it will follow that more land will have to go under leguminous fodder crops. I am certainly not satisfied that the existing conditions are all that they might be. There is no doubt that they could be very considerably improved; but it is a matter for investigation more than for demonstration.

961. As to the arrangements for seed selection in this province, we have been mainly concerned with replacing *deshi* by American. Selection within the American is only now becoming important. We have done a certain amount of rough but systematic selection and we have an organization for replacing seed; but we have not gone to any very great distance in the matter, because we have been occupied in getting *deshi* replaced by the American. As to the best arrangement for future seed supply, we have exceptionally good facilities in the form of large landlords. We must have a good system on the farms and people near Lyallpur to spread the seed to the next stage, and after that we can increase the area under pure seed very rapidly by the help of the big landlords. It is not very difficult to get seed from one district to another. The facilities are quite good enough not at present.

962. (*Mr. Roberts.*) My reasons for thinking that it is possible to do much more by improved methods in increasing the yield of cotton than of wheat, are that cotton is usually sown on land which has had very little cultivation; one of the most usual rotations is after *toria*. After the *toria* has been harvested, there is practically no cultivation as the cotton is sown within less than two months' time. This applies even more to cotton sown after gram or sugarcane. A certain amount of cotton is always sown directly after wheat. The best cotton is sown after *senji*. Very little cotton is sown on land that has been fallow for any length of time, whereas wheat is invariably sown after the land has been lying fallow for six months. I have approximate figures showing the amount of cotton sown in lines, this year. It is something like five to six thousand acres.

963. As to my estimates for the area under American cotton next year, I am estimating that we shall have 250,000 acres or so, for which we shall sell our own pure seed. The total area will probably be something between 325,000 and 350,000 acres in the Lyallpur Circle, which includes most of the area under American cotton. We shall sell 25,000 maunds of seed. It includes all except the Upper and Lower Jhelum Colonies. The ultimate figure for American cotton under present conditions has been estimated at 400,000; though I personally think that it might go considerably higher because if the price remains anything like it is at present, cotton will replace maize and even to some extent *toria*. In that case, it would not be at the expense of the wheat area but of other *kharif* crops. That is, of course, if the price keeps over Rs. 15. If it goes down to Rs. 7, that would be a different matter. A large increase, say to much more than 500,000 acres can only be made possible by increased irrigation facilities.

964. I think we have reached a state of equilibrium on the present intensity. If you increase the intensity, I certainly do not think that the system of agriculture followed in these colonies is a sound one. If you increase the intensity considerably, I think it must be followed by a diminution in yield in each crop. To give up our fallow periods, we must have increased manure in some form. The land would not stand higher intensity with the present high proportion of grain crops. If the intensity be greatly increased, much of the increase must take the form of short-period crops. That I think practically means fodder crops, pulses and gram. I cannot explain the statement that there is no demand for water in early *kharif*. The explanation might be that the distributaries or water courses get badly silted in the *kharif*. My experience leads me to believe that the *zamindars* would certainly take more water in early *kharif* if they could get it with certainty for any length of time.

965. (*President.*) Jhang is still an important district for American cotton though it has not increased in the same proportion there as elsewhere. The cultivation there is very poor.

966. In the first two years 1908 and 1909, the premium obtained at our auctions over *deshi* and over American cotton sold in the ordinary way was the same; for American in the ordinary market was getting no premium over *deshi*. At present, the success of these auctions is due to the presence of representatives of such firms as Messrs. Tatas. It would take the buyer himself much time to pick out pure cotton from a large number of carts. He gets the benefit of our organization and is saved the trouble of collecting cotton for himself. He can buy 5,000 maunds of pure American in one day at an auction whereas it might take him three weeks to gather that quantity in any other way. Another important factor is that this makes it worth the while of the chief representative of a firm to attend personally. Thus he has not to trust to the judgment or honesty of a number of scattered subordinates. The auctions now serve only two different purposes. One is that they enable us to collect our seed; and the other is that they secure the *zamindar* a better price for his cotton. Their function as illustrating the price of American cotton, which was their primary purpose, comes more or less to an end this year [illegible] red to just now could be taken over by some other agency. For the first [illegible] For introducing new varieties, auctions will be necessary. As it is, we [illegible] for the *zamindars* by organized sale; but the thing is getting beyond our ab[illegible] cient to carry on these auctions on the scale desired by *zamindars*.

967. I feel that the majority of agricultural officers find it extraordinarily difficult to get into touch with the trade (other than the local buyers) in regard to matters relating to cotton: to get [illegible] big people, with men who are in the know, and can do things, is extraordinarily difficult. I [illegible]

once a year with people connected with the trade we [illegible]

[illegible]

worst. They deal practically only in one grade. This is partly because [illegible]

[illegible]

students will find any difficulty in getting employment. The college is becoming full to its maximum capacity. We took in as many students last year as we could take. The college needs expansion and improvement, as well as more staff.

971. The Jhelum Colonies should be joined to Lyallpur for the present, in one circle. Another circle should be formed in the south west of the province. To have separate Deputy Directors for the Jhelum, Chenab, [illegible]

[illegible] seems advisable, [illegible] years before [illegible] yield up to [illegible] results seem [illegible] three farthings

over "middling." The valuation of 4 F was a half penny or farthing under "middling." Mr. Roberts had them valued in June 1916. The price of 280 F, therefore, works out at Re. 1-8 per maund more than 4 F.

973. (*President.*) It is the system in the Punjab that the seller takes his [illegible] and that in the original sale, the value of the lint and of the seed is included. [illegible] system, more or less *pukka* on which the cotton is sold on the basis of twelve seers of cotton. Then a rough test is made and the price is settled. Thus Rs. 15 may be the price for twelve seers *kan* and an allowance of twelve annas is made per extra seer of cotton. The buyer calculates the value of seed in the price he can afford to give, and the price is worked out in accordance with the Bombay price. If the Bombay price is equivalent to so much per *khandi* of lint in Lyallpur, then allowing for the cotton and the seed, cost of ginning, etc., the buyer can afford to give so much for a maund of *kapas*. The point is that the value of the seed cannot compensate for a smaller outturn of lint. Lint is something like Rs. 44 per maund and seed is only Rs. 3-12. One rupee increase on the price of seed makes a difference of about ten annas a maund in *kapas*. This year we have had a very bad cotton crop in the eastern Punjab. The demand for seed for cattle food is great and the price is high. I cannot say exactly how the firms calculate their price for *kapas*, as this has been given me confidentially. Different firms calculate in different ways, on the basis of the Bombay prices.

974. (*Mr. Henderson.*) I will give you our method of calculation, which is similar to those employed by the firms. I think that primary selection work should undoubtedly be centralized at one place. Sale organization is a different matter. That can be done at different places.

Chaudhri ANANT RAM, Municipal Commissioner, Lyallpur.

EXAMINED AT LYALLPUR, JANUARY 11TH, 1918.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

975. (1) and (20) **Experience.**—I am one of the oldest inhabitants of Lyallpur, having settled here so far back as 1896, am a member of the Chenab Colony Agricultural Association and, being a capitalist grantee of about twenty squares of land, know something about the cotton cultivation, and shall deal with the subject from the trade's point of view being a trader by profession and Honorary Secretary of the Central Co-operative Bank, Limited, Lyallpur.

976 (2) and (11) **Varieties.**—Generally only one variety of *deshi* short-staple cotton is cultivated in this district but now American cotton is coming much in vogue, which was first started about ten years ago and a variety of it known as 4 F is recommended and found successful.

977. (3) and (22) **Size of holdings.**—In this newly started colony, the land is wholly divided into squares, each square containing about 28 acres is divided into 25 equal parts, each part being known as a *killa*; generally there are three kinds of owners recognised, each peasant owner has a square or two, a yeoman grantee originally got a grant of about five squares, while a capitalist grant ranged from six to forty squares or even more. There is no special proportion of cotton fixed, but generally the average cultivation of cotton goes up to four *killas* per square.

978. (4) and (23) **Yields and profits.**—It would be very difficult to fix the average outturn of cotton with any certainty, as it depends entirely on water supply, quantity of land, climatic conditions, and the labour spent by cultivators, but taking all into consideration, the average outturn of *deshi* cotton may be put at six maunds and that of American cotton at seven maunds. The profit depends on the rate which has fluctuated so much during last years. The cost of cultivation may be calculated with the help of the Agricultural Department.

979. (5) and (24) **Rotations and manures.**—Ordinarily cotton is cultivated in fields vacated by wheat and *toria*, while the sugarcane, maize and fodder fields are also utilised. Some good cultivators let the wheat fields lie fallow for about nine or ten months and prepare that land for cotton. Cattle manure, if at all, is applied.

980. (6) and (25) **Conditions affecting increase in area.**—The area under cotton cultivation does generally fluctuate. If the cotton sells well and no unforeseen causes happen, the effect on the sowings at once becomes marked. The cultivation is often augmented by an excess supply of water, as the *kharif* crops require more water and at short intervals. The cultivation may go up to six *killas* per square. As the American cotton sells at 20 to 25 per cent. better than *deshi* cotton, so the former is rapidly replacing the latter, although it requires more water and labour and takes more time as well, and requires good soil too and in case of early winter there is great danger of its failure. As during the last two years, the cotton rate is rising abnormally, so only sugarcane can compare favourably with it, and in ordinary times wheat and even *toria* could compete.

981. (8) **Uses of seed and seed selection.**—The seed is almost solely used as food for cattle. Careful farmers usually pick selected staples from the fields, specially separate the seeds by hand machine, as in the factories the cotton gets mixed up and secondly, the impression among the people is, that machine ginned seed loses its germinating power, and when such seed is used, it is generally put ten per cent. more than the hand ginned seed.

982. (26) **Suitability of existing varieties.**—In my opinion, the American cotton is quite a success in this district, and it would be quite advisable to attempt still better varieties in this soil.

983. (27) **Prevention of mixing of different varieties.**—For ordinary *zamindars*, the difference of rates and the vigilance of the Agricultural Department are sufficient checks for not mixing up the different varieties and the tendency of the purchasers and factories to mix up can be prevented by the big firms offering for mixed goods the rate of the worst variety of mixture, and the executive officers on the spot may occasionally inspect the factories with this view and other local inconveniences of the *zamindars* can be remedied thereby.

II.—COMMERCIAL ASPECT.

984. (30) **Local trade customs.**—With regard to the marketing of the cotton crop, there are three prevalent methods in this district. Some people purchase the standing crop from *zamindars* and others buy the picked cotton from their villages and sometimes *zamindars* bring themselves the cotton to the market,

but in all three cases, the condition of the cotton is equally spoiled in picking, loading, carrying, weighing

not get cured.

III.—STATISTICAL.

986. (35) Publication of Liverpool and Bombay prices.—With regard to question No 35, if by urgent telegram, the price of the cotton is published every day in the terms of per maund ordinary people can easily understand and it may prove useful.

V.—GENERAL.

VI.—IRRIGATION.

988. (51) Wheat *versus* cotton.—Wheat is preferred to cotton in so far as the former is required for consumption and as an article of food and *bhusa* cannot be replaced by anything else as cattle food and wheat requires much less labour than cotton and less water, does not necessarily require manuring and never fails as crop. There is a proverb "The wheat farmer and the fisherman never came home disappointed."

Chaudhri ANANT RAM called and examined

(*Translation*)

989 (*Mr. Roberts*) I am a big *zamindar* holding lands in the district My experience is that American cotton is as safe as *deshi*. The only danger to American is cold and sometimes bollworm *Deshi* also suffers from insects and bollworm. If the cultivators got more water, they could be induced to increase their area under cotton. If water were available in the *kharif*, they could increase their cultivation to at least six *killas* per square.

990 The Agricultural Department should encourage the teaching of sons of farmers on the lines of the present vernacular class. I mean that illiterate boys should be given practical training in farming It you call them labourers they will not come They should be given scholarships and then they will come I

Hafiz Chaudhri MOHAMMAD ABDULLA, Assistant Director of Agriculture, Lyallpur.

EXAMINED AT LYALLPUR, JANUARY 12TH, 1918.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

(*a*) "*Deshi*" *short-staple cotton.*

996. (1) **Experience.**—My experience has been in the Chenab and Jhelum colonies comprising the Districts of Gujranwala, Lyallpur and Jhang in the former and Jhang and Shahpur in the latter. I have been connected with these tracts, particularly the former, for the past eleven years.

997. (2) **Varieties.**—The *deshi* cotton consists of the following varieties :—

Indicum yellow flowered,
Indicum white flowered,
Neglectum yellow flowered,
Neglectum white flowered, and
Multani, a mixture of several types of *Gossypium sanguineum.*

Indicum yellow flowered predominates amongst the mixtures of green leaved *deshis* to an extent of up to seventy per cent. while *Multani* exists only in traces in such cases but the latter also predominates in certain parts of the District where the soil is comparatively poorer. A considerable area can be seen growing only this variety in the Toba Tek Singh Tahsil of the Lyallpur District.

998. (3) **Size of holdings.**—About fourteen acres make the average holding per plough and twelve to sixteen per cent. of the holding is generally under cotton.

999. (4) **Yields and profits.**—The average yield is about six maunds per acre and the profit goes to sixteen to twenty rupees per acre based on pre-war prices.

1000. (5) **Rotations and manures.**—The general rotation followed is either wheat, *toria*, cotton, or wheat, wheat, *toria*, cotton, or wheat, cotton, wheat. Generally no manure is applied. Farmyard manure is given in some cases.

1001. (6) **Comparative returns.**—Cotton returns better than most of the other *kharif* crops as it requires less care and less labour in growing. Country cotton does not compare favourably with American cotton on account of higher prices of the latter.

1002. (7) **Conditions affecting increase in area.**—The area under *deshi* cotton does fluctuate. The reasons are as follows :—

(1) Water supply in the canal.
(2) Attack of boll-worm in the previous season.
(3) Effect of season on the previous cotton crop.
(4) Increase under area of American cotton.

1003. (8) **Uses of seed and seed selection.**—The seed is used whole for feeding the milch or draught animals. Seed selection is practised. Simply best looking locks are picked from the middle pickings and ginned by hand. This is a common thing with good cultivators. In certain cases, selection is done according to the advice of the Agricultural Department.

(*c*) *Exotic Cotton.*

1004. (21) **Varieties.**—The exotic cotton grown consists of American cottons of Upland Georgian origin in different forms and some strains of Dharwar, the latter occupying only a small proportion, generally mixed with the former.

1005. (23) **Comparative returns.**—The average yield is practically the same or a little better than *deshi* in the years when the latter suffers from abnormal conditions. The average yield is about six maunds per acre and the profits work out to some Rs. 30 per acre on pre-war rates. It is more paying than the *deshi* short-staple cotton and other *kharif* crops except sugarcane which pays a little better than cotton but requires greater care and labour.

1006. (24) **Rotations and manures.**—The general rotations for American cotton are (I) wheat, *toria* cotton, (II) maize, *senji*, *cotton*, (III) *chari*, gram, cotton, (IV) wheat, maize, *senji*, cotton. Farmyard manure is the only manure applied which is generally given before sowing maize. Direct manuring is done but rarely.

1007. (25) **Conditions affecting increase in area.**—The following are the points which would help in the increase of the area under American cotton :—

(i) Irrigation if available [illegible] the sowing and flowering season. In the Chenab colony, water is [illegible] per cent. of the cultivated area in both *rabi* and *kharif*, the latter getting for 25 per cent, only. Out of this 25 per cent, only half at the utmost can be put under cotton. The cultivator can attempt to put more area under cotton at the sowing time but in years of light rainfall is handicapped by not getting water in sufficient quantities later in the season when other crops like sugarcane, maize, and *taria* are also needing water. If the *kharif* supply is increased in any way, it will lead to an increase in the cotton area.
(ii) The evolution of varieties less susceptible to insect attacks.
(iii) The premium obtained per maund of *kapas*.
(iv) The increase will be limited to the extent of the decrease in the area under *rabi* food crops which play an important part both for the local consumption and export trade.
(v) The rotations do limit the increase in area as is clear from the details in paragraph 997 above.

1008 (27) **Prevention of mixing of different varieties.**—To prevent mixing in the field, pure seed grown under the supervision of the Agricultural Department should be supplied and American cotton only should be grown in a certain *ilaqa*.

To prevent mixing in the factory, the factory should deal with the American crop only and have the bales branded before issue, and deal directly with the growers, thus eliminating the possibilities of mixing, now commonly practised by the middlemen village shopkeepers, etc.).

1009 (28) *Importation of seed*.—The direct importation of seed has proved a failure, hence selected seed grown in the Province can be relied upon.

II.—COMMERCIAL ASPECT.

[illegible] —Cotton is sold as follows —

y agents
acre.

III.—STATISTICAL.

[illegible] —The cotton forecast does not show the area under [illegible]

[illegible] experience with this in the current season, though, limited, is [illegible]

V.—GENERAL.

1013 (48) Desirability of alteration in water rates.—Remission should be given on crops used for green manuring. A combined rate should be charged for gram and chari when the former follows the latter.

VI.—IRRIGATION.

1014 (51) *Wheat versus cotton*.—Wheat is a more certain crop as it requires less irrigation and is not so susceptible to insect attacks.

[illegible] critical period in regard to water supply.—April and October are the critical months [illegible] increased.

shortly

American cotton in the Punjab.

[illegible] —The history of Punjab American is very interesting and instructive. Before the [illegible] exotics including American, Egyptian, Nankin [illegible] an Agricultural Department, [illegible] om trials at the Agri Horticul [illegible] ultivators who as a rule too [illegible] of Agriculture in India, held [illegible] ssed with the results obtained. [illegible] ion, where the original as well [illegible] orticultural Gardens and the

[illegible] ltivated acclimatised American [illegible] Sargodha Farms, a guarantee [illegible] arried out by the Deputy Com [illegible] aran Dass of Messrs. Mela Ram

[illegible] ed by the office of the Director [illegible] o exist in the [illegible] rarely grown

(5) In year 1906, 1,350 acres in the Jhelum colony and 380 acres in the Chenab colony were sown with Dharwar seed. The cotton was not yielding better than country cotton but was liked by the cultivators on account of advantages gained from a regular and increased water supply, which was considered necessary in those days for experimental cultivation of American cotton. This extra supply of water was thought unnecessary later on and no such concession was allowed after 1907.

(6) In 1907, the operations which were up till then conducted by the Director of Agriculture, Punjab, were handed over to the Deputy Director of Agriculture, and 2,000 *killas* were sown in the Jhelum colony and 260 in the Lower Chenab colony. The crop did poorly in the Jhelum colony where the growers failed to prepare the land properly. This resulted in a set back for the area anticipated in 1908, when the figures for the area sown actually turned out to be 445 *killas* only. The growers in the Lyallpur District were not so severely hit, although they also reported a diminished outturn. In 1908, seed sufficient for 142 acres was sold but the actual acreage under the crop was greater, a good many of the old customers keeping their own seed.

(7) In 1909, the area showed an increase in both the colonies, 631 *killas* were grown in the Jhelum and 423 in the Chenab colony. The crop in both colonies was slightly below average and barely came up to the yield of the *deshi* crop.

(8) In 1910, 1,000 acres were grown from Dharwar acclimatised seed issued by the Department.

(9) In 1911-13, the quantity of seed distributed varied from 50 to 84 maunds only which was surprisingly small even considering its partial immunity to bollworm attack.

(10) As the results with the Dharwar American were not encouraging, so it was deemed necessary to go for the better variety. In 1906-07, preliminary work on Punjab cottons was startd at the Lyallpur Agricultural Station and seed from some hundreds of selected plants was sown separately. In 1907-08, a regular collection was made from the Punjab and North-West Frontier Province Districts. Professor Gammie also kindly supplied a complete set of his cottons and a number of plants were selected from the Dharwar American. The whole of this work, which was in charge of Mr. A. C. Dobbs, the then Principal and Professor of Agriculture, was handed over to the Economic Botanist, Punjab, in 1908.

(11) In 1909, the Economic Botanist, Punjab, handed over two varieties of American, that is, a Punjab *narma* and a Dharwar American, which did not appear to be any improvement over the ordinary crop. In 1910, 3 F and 4 F were handed over, both proving good yielders; the former being earlier was selected for distribution in 1912 and 1913. In the latter year trouble with *jassids* occurred and this cotton being smooth leaved was abandoned. 4 F was not affected though 100 acres of this, were also growing with *zamindars*. In many cases the fields were alongside those of 3 F. In 1914. some 3,000 acres of 4 F were grown and in 1915, in spite of the effect of the war, the area under 4 F rose to 9,000 acres. In 1916, the area rose to 35,000 acres and the present year gives the figures of 120,000 acres.

1019. *Seed supply and seed farms.*—As described above, the Department had to depend upon Dharwar for the seed supply until 1913 when 4 F was given out to some selected cultivators and work put in my charge. The areas grown with this variety since its introduction have been detailed above and need not be repeated. The system of working the scheme of seed supply runs as follows:—

> The Lyallpur farm makes special selections for its own sowings every year. The seed from the rest of the produce goes to seed farms, and some selected persons in the colony. The seed is issued from the farm on the conditions that the growers will grow it under departmental supervision and sell the produce according to the arrangements made by the Department. The areas so grown are inspected two to four times and advise as to roguing, interculturing, picking and storing given. A premium of two annas to three annas is paid per maund of *kapas* to the cultivator, for the extra care required out of him. This stuff is separately sold with the condition to have the seed ginned under Departmental supervision and a premium of two annas to six annas per maund of seed paid to the ginner. The acreage under these seed farms in the past five years has been as follows:—

	Acres.
1913	100
1914	300
1915	840
1916	3,000
1917	4,600

The seed so produced is sold at the Lyallpur farm and in most of the *mandis* at prices fixed by the Department. The agents in the *mandis* are from amongst the shopkeepers well connected with the colonists, who store the seed in hired godowns and receive a commission of three annas per maund on seed distributed. The agent keeps a register showing the name and address of the purchaser and quantity of seed sold to him. The buyer receives a certificate showing details of the class and quality of seed issued and is to present it to the touring officials of the Department whenever they go to his fields, and is to preserve it till the time of cotton sale. From the sale registers of the farm and the agencies, lists are prepared, and seed farms selected for the ensuing year. The seed farms as a rule are selected from the colonists growing the best quality of seed which is issued to them under special conditions as stated above. The system of seed farms is working fairly well but has its drawbacks also.

1020. *Advice and assistance to cultivators.*—From the very beginging, it was realised that American cotton would do better with better care and a start was made to sow the same with Bombay drills in 1904. The drills did not gain in popularity and most probably were not a suitable type, but my experience with some of the colonists in the Jhelum colony shows that sowing in lines was realised by a very few of the intelligent colonists, who used to sow their cotton behind the plough. The system of sowing in lines was advocated by the Departmental leaflets but rarely followed by *zamindars*. Experiments were conducted at the Lyallpur farm by sowing cotton on ridges *versus* sowing in lines on flat, and interculturing thoroughly afterwards. This was taken up in 1910 when the writer joined the farm as manager. The results were very encouraging in case of the crop grown in lines, and trial sowings were done in 1911 by me with the ordinary plough (*munna*) to which a country made marker had been adjusted with good results. Since then sowing in lines has been steadily advocated. The area sown in lines as departmental demonstrations was only some fifteen acres in 1913 when the work was transferred to this section. The increase has been constant and the recent figure goes to several thousands of acres. Demonstrations of sowing in lines are given in villages by trained men

sent from the Lyallpur farm Interculturing and other operations like thinning are advised afterwards by the touring staff.

faction amongst the growers

	Rs A P
1913 14	2 13 0
1914 15	3 13 0
1915 16	3 5 0
1916-17	4 0 0 to 7 0 0
1917 18	4 0 0 to 5 0 0

a lot of good both directly and indirectly. Besides creating a market for the

Hafiz Chaudhri MOHAMMAD ABDULLA called and examined.

(*Mr. Henderson.*) I am the Assistant Director of Agriculture I am attached to the Chenab
I have
naunds of
arrange
reman on

Rs. 15 a month. There were altogether seven *mukaddams* and the balance of the men were agricultural assistants. *The pay of an agricultural assistant starts at Rs. 60.* There were five groups for classification either one agricultural assistant and one *mukaddam* or two agricultural [illegible], two *agricultural assistants were put together—one experienced and one new.* The classification was checked by two groups consisting of six men. We issue the notices for the auctions according to the condition of the crop whether it is late or early. Mr. Faulkner *decides the date on which an auction should be held* and notices are then sent to the growers. We issue notices only to those growers with whom we have direct dealings. Notices are sent by post. We also send notices *to the Deputy Commissioners who send to the zaildars* and the *zaildars or the patwaris* inform the villagers that an auction will be held on such and such a date. On the day fixed, the cotton is brought on bullock carts. *We have a site selected for the auction and the carts are to stand outside the compound of that site.* The site is either a Government site or one belonging to the Municipality. Generally in the Montgomery district, the carts come in the day before the auction *but here they come the same day.* The cart-owners are *responsible for their own carts.* We assist them by arranging for police. On the day the auction comes off, the carts are outside the auction compound to start with The classification is done outside the compound. I do not exactly remember the number of the carts that came in at Tandlianwala but roughly there were about 200. The groups of classifiers took them cart by cart. The five groups started work in the morning and finished about 2 P.M. They took samples from four or five places in each cart. Those were mixed and an average sample was taken which was analysed to see the percentage of *deshi*. To prevent more than one man valuing the same cart, a chit is given to the cartman counterfoil of which is kept by the classifier. *The chit is in a special form giving the name of the seller,* the place from which it came, the name of the cartman and the estimated weight and the name of the *agricultural assistant who classified it. Then that cart moves off to be checked.* We accepted carts up till 11 o'clock and went on classifying up till 2 Checking started in the morning and I finished it about 3 P M. As already explained, there is another group which does the checking. The same cart is seen again and different samples are taken by the checking party from different places. The checking party remains at a fixed place at the gate of the compound. If the classification is correct, then the cart is passed into the compound. At Tandlianwala, the compound is fenced, at other places it is not but there is a sort of drain round and in certain places a sort of wall. There is no danger of any other carts going in as there are police men and *mukaddams* to stop them. The ground is marked out into blocks with labels, A. B. C. and D. The carts are sent off in charge of a man who can read and write and go to their proper block and stay there. After the checking is finished, we add up the totals of the various classes. Then the sale starts. The time at which it starts varies. The whole of each of the classes is put up for sale at a time. *Delivery has to be taken on the same day according to the rules but generally as the quantities are very big, we treat the second day as the first day* and the weighment starts on the second day. Weighment takes place after the auction. The buyer is given *an estimate at the time of the sale.* The buyer has to pay the *aratyas* (commission agents) who are responsible for prompt payment to the seller. The cultivator gets his money from the *aratyas* as soon as weighment is finished. There are different *aratyas* for the different people. As to the number of *aratyas* at Tandlianwala, the A. class was only a limited quantity. For the B. class which was over 1,500 maunds, there might be a dozen *aratyas*. All the *aratyas* were known to me because they were *mandi* men and the people have confidence in them. *These aratyas get a commission of Rs. 1-6 per Rs. 100 in this colony. It is Rs. 1-9 in Montgomery.* This is for the weighing, for supplying men for weighment and for scales. The *aratyas* are responsible for prompt payment *but they get their money within three days from the buyer. The aratyas* pay the seller straight away. We know that the seller gets his actual price, because we give him a chit showing that the cotton has been classed in such a class and that so many maunds have been sold. All the cotton is weighed on beam scales We help buyers in the way of transit. The Railway Department gives the Director of Agriculture a certain amount of priority. *As to the period for which the staff was occupied with the sales at* Tandlianwala, they went on the morning of January 2nd, and half of them returned on the evening of January, 3rd. The rest had to stay until the weighments were finished, *i.e.*, till the 6th afternoon. We do not charge travelling allowance to the expenses of the auction. That is paid from Government funds. We have no special staff for auctions but we take men from different sections. This year we took men from Gurdaspur and from Hansi as well as assistants from the agricultural section of the College. *We take about fifteen to twenty men everywhere including mukaddams.* When they have finished, they are sent back to the farms. Their absence does interfere with farm work. I do not think that we could go on *with auctions for a long time.* They will go on as long as the war lasts. The auctions were started to introduce a better price for better cotton. In the beginning the quantity was small and it was difficult to *get a fair price for it but now that the quantity is so large and fair premiums are paid by factory owners and* other buyers, I do not think there is any necessity for auctions. If the auctions continue, I would *certainly advocate a permanent extra staff* to do the work in future. There are certain drawbacks to the auctions owing to fluctuations in the market. At Gojra, we had two classes which *we could not sell as the prices offered were very low and we* had to return those classes There were no buyers. People cannot afford to carry cotton back twenty or twenty five miles.

1023. (*Mr. Roberts.*) I have been in this colony practically for the past eleven years and I was never out of *touch with it.* I was working in Sargodha but I was connected with this Colony also. I saw a good deal of American cotton in Jhang before 1911. The immunity of American cotton to bollworm has been a big factor in its success. The *zamindars* regard the American cotton as a safe crop in comparison with *deshi.* As to whether the profit on American is greater than for wheat, *now-a-days it is greater.* In pre-war days, there was not much difference If American cotton is selling at Rs. 10 per maund and wheat at Rs. 3-8 per maund, I should say that cotton would be profitable but wheat more certain. The average yield of wheat is about fifteen maunds and that of cotton six maunds. *There have been averages up to eighteen maunds* in Chak 32. The highest yield on the farm is over 22 maunds with 4 F. The average yield of wheat last year was about twelve maunds. The year before it *was thirteen. For the last two years it has been below* the average.

1024. If the supply of water in April and *to the end of May* were certain, it would lead to an increase in the area under cotton as the *most profitable crop grown.* As a general practice now, people sow five or six killas of cotton in a square. As regards the *water supply, the question is not acute in May,* June and July. There would be no difficulty in increasing the area *under cotton,* if water could be made available in October and to some extent in April. American cotton has been *sown up to the 20th of May* but generally it is sown up to the end of April. American cotton sown in May is not very safe, especially if there are early frosts but the cotton we have sown in these colonies up to the 10th *of May during the last two years* has been fairly

successful. This year sowing went on up to the

Maund. They used our scales as well as our weights.

1026. (Mr. Wadia.) I settled the allowances for dampness. They did not agree to my decision so I had to get Mr. Faulkner to settle the matter. It was finally agreed that my decision should stand. The penalty for not paying on the second day is one anna per maund and on the third day it is three annas per maund.

Shahzada GHULAM MOHAMED, Municipal Commissioner and Zamindar, Sargodha.

Examined at Lyallpur, January 12th, 1918.

Written statement (Translation).

I.—Agricultural Experience.

(a) "*Deshi*" *Short-staple cotton.*

(a) *Tillar* (b) *Rattar* or *Rati*. (c) *Wains* (d) *Poni*. (e) *deshi Shahpuri*.

(a) *Tillar*.—The seed of this cotton was originally brought from Nabha State and Ludhiana side by the factory-owners and sold at the early settlement. This cotton on account of its yielding a greater percentage

(c) *Wains* … more affected by bad weather than the above two

places and are not popular with the *zamindars*.

1030. (4) Yields and profits.—If the average of the last ten years' produce of the New and Old

also to cotton.

1032. (6) Comparative returns.—American cotton fetches a higher price than *deshi* cotton and bad weather has comparatively less effect on it.

1033. (7) **Conditions affecting increase in area.**—The last ten years' experience proves that the cultivation of short-staple *deshi* cotton is decreasing every day, the reason being the higher price, sale under Government supervision and the successful resistance of the American crop to the effects of bad weather. If arrangements for the supply of water to land at the time of tilling for the cultivation of American cotton were made to the satisfaction of the cultivator, it is possible that *deshi* cotton would cease to be grown. Since the cultivators have come to know of the superior qualities of the American cotton, the *deshi* cotton is grown only when there is scarcity of water. *Deshi* cotton yields a good harvest in untilled land, and grows well even if sown late, but the American does not give a good harvest under these conditions.

1034. (8) **Uses of seed and seed selection.**—Cotton seed is only used as feed for cattle. The cultivators generally gin it with country hand-gins (*Lailna*) for seed purposes. The seed of the cotton picked in the month of *Katak* (15th October to 15th November) is selected and ginned with the country hand-gin.

1035. (9) **General economic conditions.**—I beg to say that, if the Government desire that American cotton should be produced in larger quantity, the area under it could be extended from four to six *killas* per square provided that the condition to keep mares were removed for the area, which is cultivated for one mare for its green fodder and is never less than two *killas*, and if the cultivation on those two *killas* of American cotton were made obligatory, the cultivators can grow six *killas* of American cotton willingly. The orders for keeping mares should be rescinded.

(c) Exotic cotton.

1036. (21) **Varieties.**—Dharwar and No. 4 F, as proposed by Department of Agriculture, Punjab, are the varieties grown.

1037. (23) **Comparative returns.**—*Deshi* cotton can not be compared favourably with American cotton, for the latter never totally fails on account of the various vagaries of the weather, and the prices obtained are also higher, through the patronage of the Agricultural Department Officers, of course. Other crops also, for the reasons stated above, cannot stand a comparison with American cotton. The average outturn per *killa* of the cotton is about 3½ maunds to four maunds. The average price obtained during the last ten years is Rs. 10 a maund, average water-rates and land revenues is Rs. 7-8-0 and cost of seed is eight annas per *killa*, that is to say after deducting Rs. 8—the land revenue and cost of seed—if the cost of fodder for four cattle, the household expenses and the wages of labourers be ignored, the average profit comes to Rs. 27 to Rs. 32.

1038. (25) **Conditions affecting increase in area.**—In my opinion, the following measures would prove useful in bringing about an increase in the cultivation of American cotton:—

Firstly, water should be obtainable at the time of preparation (tilling for cultivation).

Secondly, its cultivation should be defined in such a manner that the condition of breeding horses may be set aside and in its stead the cultivation of American cotton should be made obligatory.

1039. (26) **Suitability of existing varieties.**—In my opinion, of all the exotic cottons, No. 4 F is the best and this alone should be sown and in order to extend its cultivation the patronage of the Government should be given to the cultivators at the time of its sale, and they should be in every way encouraged, so that, as in the case of other products, they may not be entrapped by the mill-owners and the village shopkeepers.

1040. (27) **Prevention of mixing of different varieties.**—In my opinion, if the following measure were adopted, the exotic cottons would not be mixed with *deshi* cotton:—

(a) The mill-owners can never supply unmixed seed, for they gin *deshi* cotton and the American cotton at the same place and, therefore, I submit that the Sargodha Zamindars' Association should be ordered to put up an oil engine and an agreement should be taken from them to the effect that they shall gin American cotton, under the supervision of the Agricultural Department, pure and that they should supply pure seed for the whole area alongside the canal and the Zamindars' Association should be held responsible for the quality of the seed. Accordingly the Department of Agriculture has already recommended the installation of an oil engine for the Sargodha and Bhulwal Association. The Department of Agriculture sells all kinds of pure seeds through this Agency.

(b) Village shopkeepers, in order to make undue profits, get all kinds of cotton at cheaper rates by advancing money to cultivators and other labourers or by any such means, and sell the seed mixed. The Government should therefore by taking some money from a big firm, advance it through *zamindar* banks to the cotton cultivators for meeting their necessities which compel them to sell cotton in the cotton harvest time, and the cotton should be sold through those banks or through the cultivators, as it is now done, under the patronage of the officers of the Department of Agriculture. And the cultivators, whose cotton is the best, should in some manner be encouraged in order that they may be prevented from selling the cotton to the local shopkeepers, for the main cause of mixing is the village shopkeeper.

(c) The mill-owners in order to make undue profits, mix *deshi* cotton of good quality with American cotton and then blame the cultivators for having brought such cotton. The Government can check them and if any proof be needed, it can be had very easily. The village shopkeepers and the mill-owners are the cause of giving a bad name to the cultivators.

1041. (28) **Importation of seed.**—In my opinion, seed should be got from America or Egypt after every four years, for, after four years the seed, under the effects of climate and soil, cannot retain its original strength.

1042. (29) **General economic conditions.**—As regards obtaining an increase in the cultivation of American cotton and purity of seed, I think that the Department of Agriculture has, in fact, by setting up model farms, inspired the cultivators to some extent to grow exotic cotton, but because the Department of Agriculture is only at one place in one district, and the farm cannot be seen by every cultivator, only a few rich *zamindars* occasionally see it and gain some experience, and so the cultivators of every grade are not benefited. The operations of the Department of Agriculture should, therefore, be extended in such a way that, in the centre of every ten thousand acres of land, five squares should be granted to some *zamindar*, who is interested in the Department of Agriculture and is fully acquainted with farming and who, under the instructions of the Department of Agriculture, would cultivate American cotton on a large scale, and in that area of ten thousand acres he should always give necessary instructions to the cultivators and should always inspect personally their method of cultivation and show them his own model farm so that every *zamindar*

should envy him on seeing his model, and should grow the same cotton and keep it pure, for, in this country the cultivators do everything out of envy very soon.

II —COMMERCIAL ASPECT

[illegible]

the cotton disposed of regularly

III —STATISTICAL.

1044 (35) **Publication of Liverpool and Bombay prices** —The daily publication of Bombay and [illegible]

V —GENERAL.

1045 (46) **Attitude of buyers to improved cottons** —Up to present no purchaser has given any particular premium to encourage the cultivation of exotic cotton.

1046 (47) **Effect of water rate** —The water rate has no special effect on any particular crop

1047 (48) **Desirability of alteration to water rates** —The water rate should be fixed on the basis of the actual discharge, which is not the case at present

Shahzada GHULAM MUHAMMAD called and examined.

(*Translation*)

1048. (*M* [illegible] area fifty *killas* in all. [illegible] more profitabl [illegible] only 2¼ maunds [illegible] very much and all the bolls were knocked off

1049 (*Mr Roberts*) In my opinion if water were given in proper time in the *kharif* from April it would be possible to grow six *killas* of cotton on each square instead of four i e fifty per cent more American cotton always pays better than wheat or *deshi* cotton. I have been cultivating American cotton since 1908 In comparison with *deshi* cotton it suffers very little from insect pests or from rain It suffered only in one year 1908 but even in that year it recovered a good deal. If water were available, the intensity of cultivation could be increased to 125 per cent. The present intensity is 100 per cent or less than 25 *killas* to the square. We could cultivate 32 *killas* per square.

1050. At the auctions, the price paid was Rs. 21 6 per maund. Since then the market price of *rui* has gone up by Rs. 60 a *khandi* but the buyers in Sargodha now won t give more than Rs 18 a maund for pure American because the auctions have stopped.

Mr. D. MILNE, B.Sc., Economic Botanist, Punjab

EXAMINED AT LYALLPUR, JANUARY 15TH, 1918

Written statement

[illegible]

ing may commence as early as the end of March. Most of the area of cottons in the Province is sown, however, in April and early May, April being the best month for cotton sowings. End of April and early May sowings are done on lands irrigated by perennial canals and from which wheats have been harvested in April. It is also done in a few cases where irrigation water is very scarce or where there are other obstacles to the farmer having the whole of his area sown earlier. On lands irrigated by inundation canals, sowing may be done in May or June. On unirrigated areas, the dates of sowings depend largely on when enough rain falls to enable the farmers to till the soil and to provide sufficient moisture to germinate the seeds. Sowings on such areas may be done from April even to July. Cottons sown in June and July yield comparatively poor crops. Those sown in July are often ratooned, *i.e.*, left standing for two or more seasons before being uprooted. They do not appear to have time to develop themselves properly in the first season and generally yield best in the second season after sowing. They are usually uprooted in the third or fourth season. As one would expect, cottons grown on all unirrigated lands yield very inconsistent outturns. In dry years, the crop per acre is much less than when the rainfall is good (for figures on the point see Season and Crop Reports of the Punjab Agricultural Department). American cottons are not grown on unirrigated lands. Among Indian cottons, the picking season usually begins about the middle of September on both irrigated and unirrigated lands and it continues to about the end of November. The picking of American cotton usually commences in early October and continues till the end of December. In wet years, such as the past season, when vegetative growth is rank and the first formed flowers have dropped from the plants owing to heavy rains, picking of both *deshi* and American cottons may commence several weeks later than it does in dry years.

1053. *Soil.*—The soil in the plains is alluvial. The depth of the deposit is unknown in many places and in most places it reaches far below the depth to which any roots penetrate. Cotton roots may descend nine feet or more into the soil and the character of the deposit to that depth at least should be considered where cottons are concerned. At the surface and often to a depth of many feet below that, the character of the land here ranges from almost pure sand, where the water current which deposited it had been swift, to stiff clay where there had been little or no current. Traces of these currents are frequently met with in the plains. They are often very sharply marked and sometimes make soils of very different quality in fields lying close together. This, as I shall show later, has a very important bearing on long-staple cotton-growing in the Punjab. Hard nodules known as *kankar* and composed largely of carbonate of lime and clay are common in the soils and more or less hard layers of *kankar* nodules from a few inches to a few feet in thickness are frequently met with.

(2) White efflorescence salts locally known as *kalar*, *rel* or *shora* are to be found in large or small patches in most parts of the plains. Where these salts are at all concentrated, they harm or destroy the crops. The permanent water level is anything from almost the surface of the soil in such places as along the banks of the Indus in the season when the river is in flood to over 100 feet from the surface in some parts of the plains. On most lands the permanent water level is quite low enough to admit of the proper development of the root systems of crops.

1054. *Climate in the Punjab.*—The climate in the plains of the Punjab is hot and dry in summer and mild in winter. From the beginning of May to the end of September it is very hot. Our hottest month is June; the normal maximum shade-temperature (mean of ten years) for that month is recorded at between 101 and 110° Fahrenheit for different stations in the Province, but, in many places, temperatures of over 120° F. are frequently recorded. Usually there is a drop of between 20° and 30° F. in the temperature at night. From June the temperature gradually falls till in January the average maximum shade temperature for the stations above referred is to 63° to 71° F. with again a drop of 20° to 30° F. at night. In December and January, we usually have a few nights when the thermometer registers very slight frosts, and every few years we have a winter with a few nights of frost which does considerable damage to mango trees and other comparatively tender plants. Occasionally also slight frosts occur in November. If these frosts occur in November or December, they prevent the proper development of the lint in the later formed bolls of American cotton. Bolls so affected also do not open well. The harvest of *deshi* cotton being over by the end of November, these cottons do not usually suffer in this way.

(2) The rains which we get chiefly fall between early July and the beginning of September. We also usually get a few showers in January or Febuary. The average annual rainfall ranges from about seven inches in the plains at Multan to about 31 inches at Rawalpindi, which is at the base of the Himalayan Hills. For more detailed information see tables of average temperatures, rainfalls, humidities, winds, etc., attached (Annexure I). I designed these tables, a number of years ago, in order to assist me in comparing our conditions with those obtaining in other cotton-growing countries. The data for them were kindly supplied to me by the Director of the Indian Meteorological Department, Simla. I have already found these tables very useful in connection with the crops which I have worked on or wished to try in the province. For use with the meteorological tables, the map of the Punjab issued by the Irrigation Department should also be studied, but I hope to have this map replaced soon by one showing canal irrigated areas, perennial and inundation; areas irrigated by wells, non-irrigated and waste areas, the principal markets, railways, canals, contour lines at decided intervals, etc., etc.

1055. *General remarks on the kinds of cotton growing in the Punjab in 1907.*—Indian cottons were being grown in all cotton-growing tracts in the province and constituted practically the whole of the Punjab cotton crop. The examination of any single field seen, however, invariably showed it to be composed of an extraordinary mixture of species and types of cottons to which I shall refer later. Some impure plots of a cotton, evidently *G. hirsutum* and generally called *narma* were to be found. This cotton appears to be an American cotton. The date of its introduction is not clear. It may have come into the province with any of the several attempts to introduce American cottons into the Punjab, but it had evidently been growing in insignificant plots or as straggling plants in fields of country (Indian) cotton since any one that I have met can remember. American cotton seeds have been brought into the Punjab at various times during the past sixty years or more in attempts to start their cultivation here and it may have come in with any of these. An Upland American cotton (*G. hirsutum*) introduced in 1904 into the Punjab from Dharwar in the Bombay Presidenhy by Mr. Renouf, Director of Agriculture, Punjab, had been tried against the old *narma* cotton and others, and, being considered better than these, it had been decided to push its growth in the Punjab. Consignments of its seeds were repeatedly brought from Dharwar by the Agricultural Department between 1904 and the time my own selections were sent out to growers. This Dharwar cotton is known in the Agricultural Department as "Dharwar American" and the name is commonly used by people outside the Agricultural Department. I may mention that the term *narma* in the vernacular means "soft" and that, in some parts of the province, it is applied to both the old American cotton and to the Dharwar American. It is even

applied to some varieties of *deshi* (Indian) cotton. For example we found it applied to all types of *G sanguineum* in parts of the Shahpur District Straggling plants or very tiny impure plots of a *khaki* linted type of *G hirsutum* were also to be found

p improvement work for the

Wils
not t
to n
scien
the I
in th
that
on tl
grad
and I ha ... my best to carry on the work on those lines

1058 *Note written in February 1908 on my sphere of work by the Inspector General of Agriculture in India* — In February 1908, the Inspector General of Agriculture in India visited Lyallpur and wrote as follows —

and examined by me at the end of that picking season

1061 *Definition of an improved cotton* —From talks with assistants, while they were collecting *kapas*

types of this vast collection and so got rid of the inferior ones nor could I make satisfactory progress with the work until we had decided what an improved cotton is and could set up a criterion by which I and the

men engaged to assist me could work. Questions in various directions elicited extremely diverse opinions and it was soon evident that the point had to be threshed out. In isolating or evolving new types of plants the object for me to aim at seemed to be the production of types that would yield increased profits per acre as to obtain that appeared the only reason why any one should prefer to grow our new types at all. I therefore defined improved types as those which in ordinary agricultural conditions here would yield to growers larger profits per acre than the types which they were already growing, then began to try to discover the various factors involved in this definition and to assign to them their relative values in the criterion to be set up.

1062. *The kan-factor.*—At this time there was a very strong opinion that selection for *kan, i.e.*, the weight of lint got from unit weight of the unginned cotton (*kapas*), was the main, if not the only, point to be kept in view. This was strongly backed up by cotton traders and my first struggle was against this opinion. The value of a difference in *kan* in *kapas* when I went into the case with cotton dealers here is shown in the following:—

The Karachi price for acclimatised American cotton was, say, Rs. 27 per maund (82 lbs.).

Dealers had to deduct—

	Rs.	A.	P.
(1) Cost of ginning one maund of American cotton, say	1	6	0
(2) Cost of pressing one maund of American cotton, say	0	8	0
(3) Cost of freight of one maund to Karachi	0	15	0
TOTAL .	2	13	0

The value of unginned fibre in Lyallpur was therefore Rs. 27 less Rs. 2-13, *i.e.*, Rs. 24-3 per maund or Rs. 0-9-8 per seer ((1-40th maund). Where three maunds of *kapas* contained one maund of fibre and the dealer could get about Rs. 2-7 per maund for the cotton seeds, he would deduct a few annas for wastage in ginning, etc., and would estimate the value of the seeds got from the three maunds of *kapas* at something like Rs. 4-2. The dealer therefore in this case had the following facts in mind:—

(*a*) that for *kapas* containing one-third of its weight of fibre, he could offer Rs. 24-3 *plus* Rs. 4-2, *i.e.*, Rs. 28-5 for three maunds or Rs. 9-7 per maund;

(*b*) that if the *kapas* contained less or more fibre than one-third maund of its weight, he could deduct from or add to the above at the rate of Rs. 0-9-8 per seer (1-40th maund).

(2) We find American *kapas* giving anything between 11½ and 13½ seers of fibre per maund or at the market rate above quoted differing in value from Rs. 8-5-7 to Rs. 9-10-11 per maund. In *deshi* cottons common in the Punjab, we find the *kapas* yielding anything between 11½ and 16 seers of fibre per maund and sometimes making a difference of Rs. 2 per maund in the value of the *kapas*. Obviously then it is a very important thing for farmers to grow a cotton with a high *kan*, but if an improved cotton from a farmer's point of view is one that will leave him a greater profit per acre than those he is already growing and it seems to me that this must be so, then *kan* is by no means the only factor that he must keep in view. Further, when I had ginned my thousand or more samples of *kapas* referred to already and had set aside all those with a high *kan* record, I found that there were very great dangers in selecting by high *kan* figures. I found for example that, in a number of cottons which had given me high *kan* figures, a large number of crushed cotton seeds had been left among the fibres. These broken seeds having not only added considerably to the apparent weight of fibre but reduced the real weight of seeds, a false and very high *kan* figure was recorded. This crushing of the seeds during ginning happens especially in damp weather.

(3) To obtain vigorous healthy plants, we require well developed seeds containing a plentiful supply of food for the baby plant but it was seen that most of the parcels giving the highest *kan* records contained a very large percentage of seeds immature, or small or of which the food store had been devoured by bugs. Indeed the results got showed quite clearly that selection on these lines would have led not towards improvement of the crop but in quite the opposite direction. Bug sucked and immature seeds being unfortunately lighter than sound well developed seeds it was evident that even a very small amount of fibre from each of such seeds would show a high *kan* figure. It is also evident that small seeds have a much greater surface in proportion to their weight than large seeds have and therefore if a small seed and a large seed were merely equally well covered with fibre, the small seed would show the higher *kan*. Again a small seed may be worse covered than a large seed and still show as high a *kan* as the larger one. In attempting to raise the *kan* figures, there is thus a tendency to select smaller and smaller seeds or unsound ones which, because of their small size or unsound food store, are unable to produce healthy vigorous plants. What the farmer really wants when he asks for a cotton with a improved *kan* is a variety which gives a large proportion of sound well developed seeds bearing a greater amount of fibre per unit area of their surfaces than is borne by the seeds of ordinary varieties. Unfortunately the *kan* figures obtained in the manner in which he obtains them at present do not help him in this, and it is therefore absolutely essential for *zamindars* when considering the *kan* figures to examine the soundness and size of the seeds in the consignment, the freedom of the fibre from crushed seeds, etc.

1063. *Outturn of kapas per acre as a factor.*—When we do find a variety which has well developed seeds and a higher *kan*, we are even then not certain that it will be a more profitable variety to grow, for although the *kan* of one variety may be higher than that of another, the second variety may have yielded so much more *kapas* that it gives a greater amount of fibre per acre, therefore the farmer who has selected his cotton for *kan* only may have done himself considerable harm as far as profit per acre from his crop is concerned. Some years ago, a sample of a variety of Indian cotton with an exceptionally high *kan* was sent to me along with a letter stating most decidedly that this was the Indian cotton which the Agricultural Department should advise farmers to grow. The extremely high *kan* and the nice appearance of the *kapas* had attracted the attention of the gentleman who sent the sample. I had eliminated that variety from the Lyallpur experiments, however, as after growing it for several years we found that it invariably gave such a poor outturn of *kapas* that farmers could obtain more money per acre by growing other Indian varieties. Indeed from our experiments here

NOTE.—*Kan* is sometimes expressed as the percentage weight of fibre got from the *kapas* and sometimes as the number of seers 1-40th maund) of fibre got per maund (82 lbs.) of *kapas*.

acre.

1065. *Other factors in profit per acre* —Other important factors affecting the case are connected with the habit of the plant, resistance to disease, etc

1066 *Method of judging cotton plants on very small plots* —In order to give the points of importance as nearly as possible the relative values agreed on and to set before myself and staff, as clearly as I could, an

perience in the work :—

	Maximum marks.	*Total marks*
HABIT—		
(a) Freeness	1	14
(b) Compactness, i e, many lateral branches starting from the main stem, short internodes	8	
(c) Well developed bolls	2	
(d) Number of loculi, one mark for each loculus above the ordinary number	1	
(e) Earliness	2	
HEALTH—		
(f) Resistance to insect pests	15	25
(g) Resistance to fungus and other pests	10	
YIELD—		
(h) Minimum 10 maunds per acre (3 marks per maund above 10 maunds up to 20 maunds)	30	30
LINT—		
(i) Length of lint; minimum 0 8" (marks for each 0 1" above 0 8" up to 1 2")	12	31
(k) *Kan* (minimum 25 per cent weight of *kapas* to be fibre) and seed properly covered; regularity in length of lint, strength, fineness and smoothness, etc.	19	
TOTAL	100	100

...ground were very badly attacked, it got ...o marks were given under that head

possible, the probable profits per acre from the selections while on the small plots to which I was limited, I made out Form A below :—

Cotton Records.

Number of row and plot.	Number of variety.	Percentage of germination.	HABIT.	STEM.					LEAF.									FLOWER.			
			S. = Spreading; E. = Erect; M. = Medium; D. = Drooping.	H. = Hairy, S. = Smooth.	G. = Green; R. = Red; G. R. = Greenish Red; R. G. = Reddish Green.	S. = Strong W. = Weak.	*Internodes.* Length in inches.	Height of the plant in feet.	Length in inches.	Breadth in inches.	L. = Length; B. = Breadth; and S. = Shape; of the longest lobe.	Shape of sinus.	Number of lobes.	Upper side H. = Hairy; S. = Smooth.	B. = Brittle; Tk. = Thick; Th. = Thin.	*Tints.* R. = Red; G. = Green.	Shape and number of glands.	*Colour of the petals.* R. = Red; W. = White; Y. = Yellow.	*Eye.* C. = complete; I. = Incomplete; T. = Trace; A. = Absent.	Length of the pistil above the stamens in inches.	Shape and number of glands, C. = Calyx; B. = Bracteoles.

BOLL.		BRACTEOLES.			Date of sowing.	FIRST PICKING.		LATER PICKING.		LAST PICKING.		LINT.	HEALTH OF THE PLANTS.	Reasons for selection.	REMARKS.
Number of Carpels	Sketch of the boll.	Shape.	L. = Length; B. = Breadth in inches.	Length of the longest lobe.		Date.	Amount.	Date.	Amount.	Date.	Amount.	Colour, length, regularity, strength and quality.	R. = Robust; S. = Sickly; F. = Fair.		(Notes on petals, general character of the plants not already included, final recommendations as to their selections, etc.)

(2) I had this form filled up annually for each plot of selected cottons. As different people were to fill up these forms and their value as records would be in proportion to their accuracy and the degree to which they could show differences, I made the column headings so that the information to be filled in should be as definitely comparable as possible. For example, in the case of the boll, a typical specimen is simply cut in half lengthwise, placed on the paper and a pencil line drawn round it. The outline of a transverse section is got in a similar way. This eliminated idiosyncrasies of judgment as to whether the boll is large or small, how the shape of its apex should be described and other points that would come into the case should a written description be attempted. To get figures for the percentage stand column, the number of properly spaced plants that would be grown on the vacant spaces in the plot without unduly crowding the plants actually growing is counted, subtracted from the ideal number of plants which should grow in the plot and the stand of the crop is expressed as a percentage of the ideal stand. This column, backed up by one giving the height of the plants in feet and inches and a few remarks on the regularity of the stand, gives a good deal of useful information. For example, it shows whether a poor outturn of *kapas* is due to poor yield from a good stand of well grown plants to paucity of plants, or to a fair number of plants which are poorly developed owing to some cause such as poor soil, bad cultivation, etc., etc. These columns were therefore very helpful to me in interpreting the outturn figures got from my experimental plots in terms of the normal cropping powers of the selections.

(3) Counting the actual number of plants growing in a plot was found quite impossible as a general practice even on my small experimental area of land because of the tremendous amount of labour entailed in counting each plant in all the plots. Even on individual plots it was very unsatisfactory because when two plants had been left in one hole at thinning time or where some plants had been planted closer than they should have been, useful figures were naturally got neither when two such plants were counted as one, nor when counted as two, and the adoption of any intermediate course would have entailed very indefinite orders.

1068. *Further records kept.*—Records of the dates of sowing, cultivation, irrigation given, etc., were entered in another register, and from the time I had my experimental lands laid out, I had maps made annually showing the patches where crops were better or poorer than usual, where they were badly diseased, etc., and notes were made on the possible causes of these differences in the crop.

1069. *Markedly different characters in different plants of unselected Dharwar, American and Narma cottons shown to be hereditary.*—Walking through a field of the Dharwar, American or narma cottons growing on the Agricultural Farm, and on farmers' field in 1907, the extraordinary differences in the health of the plants in any one field at once struck one, and on closer examination the differences in length and quality of the lint, *kan*, etc., were hardly less striking. In the summer of 1908, when examining the plots of cotton selected in the picking season of 1907, these same differences in health, habit, character of the lint, etc., were markedly obvious, while in some cases the characters of all the plants of a selection were extremely uniform. In an experiment in which packets of seeds from each of ten individual plants were divided into seven lots making seventy lots in all and sown in separate rows on seven different dates and on seven different areas, the characters of the progeny of any one of the ten original plants were so uniform and distinct over all the areas of that selection that all probability of the extraordinary difference in character noticed among the other selections, being due (within limits) to slight differences in the soil in planting or any of the other matters for which

labourers could be responsible, had to be dismissed. This and similar evidence that these characters were hereditary enabled me to reject a large number of our first selections with some confidence almost at once, and indicated that Dharwar, American and narma cottons could be easily improved by a single selection alone. It also indicated that those selections which produced plants that did not have similarly good characters were grown, and this has been repeatedly demonstrated since then. A notable feature was that the plants [illegible]

[illegible] crop) were sent to various spinners and traders for opinion as to their comparative qualities and commercial values, also for comparison with important commercial cottons of other parts of India and elsewhere. This has been repeated annually since then. I am especially indebted to Messrs. Tata and Sons, Spinners, Bombay, the British Cotton Growing Association, Liverpool, the Chamber of Commerce, Bombay, and Professor Gammie, the Imperial Cotton Specialist, in this connexion.

1070. *Tests after the selections had reached the stage of small plots.* After the selections had reached the stage of small plots and we had got the spinners and traders' valuations of their lint, these selections were [illegible] value of crop per acre which each produced after taking into consideration [illegible] the area of [illegible] be or which would influence the [illegible] from the crop.

(2) The great value to us of our attempt to discover the *factors involved in the improvement of cotton*, to assign to these factors their relative economic values and to judge our selections on this standard has been apparent at every turn. For example, in 1912, Messrs. Tata & Sons in valuing our cotton samples wrote: "only one sample No. 161 can be compared with American. It is splendid cotton, especially in length and strength of its fibre. If the cultivation of this cotton turns out a commercial success, it will [illegible] the problem of obtaining long stapled cotton from British territory." It was evidently by far our best cotton from the spinners' point of view in the earlier years of our work, but when its cropping powers, etc., were taken into consideration it was found that many other of our selections were much more profitable from the growers' point of view, and that to have sent it out to farmers would have been a step in the wrong direction. The case of the Indian cotton with the very high lint mentioned above is another example.

1071. *Influence of soil on the acclimatised American cottons.*—As already stated, I have had a block of thirty acres of land set apart for experimental work on crops and ten acres of this have been under cotton [illegible] A comparison of the crops [illegible] the data recently [illegible] of fair [illegible] the [illegible] and [illegible] of the Punjab [illegible] the facts that [illegible] of American [illegible] acres of salts [illegible]

(2) The fact that the American cottons grown on poor sandy soil give a small amount of kapas per acre had been noticed by zamindars, but our data showed us also a point of much greater importance as far as cotton improvement work and American cotton growing is concerned, viz., that the lint grown on these sandy soils was not only shorter in general but so weak and irregular in length and strength that if mixed with that of even the same selection grown on fair quality of land the character of the whole consignment would be ruined.

(3) Messrs. Tata and Sons, when valuing a number of samples of cotton grown on this sandy strip in 1912, remarked on the great irregularity of the length, etc., of the fibres. Next year when the lint of some of the selections grown on better land were valued by the same firm they noted the absence of this irregularity. In 1915, when the same cottons were grown on the same land as in 1912, the same irregularity in the lint appeared while in 1916, it disappeared. Since 1912, I have repeatedly found that fibre from selections which obtain high valuations when grown on good soil sink to comparatively low valuations when grown on these sandy lands and when a strip of one selection of cotton begins on good soil and ends in the sandy streak, good fibre is got from the plants on the good land while poor irregular fibre is got from those on the sandy soil. At the [illegible] Lanerk farm at [illegible] near Lyallpur, where Dharwar American cottons have been acclimatised and grown for a number of years back, the former Manager ([illegible]) also found that, while the loamy plots on his farm grew excellent crops of these American cottons, the same cottons were a failure on sandy plots there. In my experimental lands at Lyallpur I have got moderate crops of Indian cottons where the American crops have been failures; and at other places in the Punjab, I have noticed that American cottons have been a failure on sandy lands where Indian cottons have given a small crop. The lint of Indian cottons being shorter and stronger than that of American cottons is less [illegible] affected. From these experiences it is quite obvious that differences in the quality of the soil are a very much more important factor in cotton growing than they have hitherto been believed to be. From the beginning of these experiences, it appeared to me that the short irregular fibre got on such sandy lands as the streak in our experimental area, was due to a poor water holding capacity of the soil, and I hoped some day to have had analyses of the soils in [illegible] taken [illegible] on such points as the [illegible] of the [illegible] relation [illegible] of the soil with differences in its water holding capacity, the effects on the length and [illegible] of the lint of differences in amounts of moisture in the soil at different stages of the plant's life, &c. [illegible] owing to want of staff, I regret to say we have never got further than the [illegible] of a few [illegible] of [illegible] other [illegible] attempts which have been interfered with by [illegible] or in other ways. [illegible] of the [illegible] of the [illegible] A proper staff is urgently required for these important [illegible] must be thoroughly and properly before we can [illegible] the [illegible] of long stapled cotton growing in the Punjab.

(4) It is already evident, however, that farmers will get disappointing results regarding the [illegible] as well as the quality of [illegible] if they sow American cottons on sandy lands [illegible] and American cotton is grown in a [illegible] and part of the crop is grown on these poor sandy [illegible]

that part, if mixed with the other, may ruin the whole consignment from the spinners' point of view; also that in judging which of a number of selections is the best from our point of view we must be very careful to take into account the quality of the land on which they were grown.

1072. *A few remarks on the influence of climate on American cottons.*—In 1909, through the kindness of Mr. D. Fairchild of the Department of Agriculture, United States of America, Washington, D. C., I obtained several varieties of Upland American cottons, and these have been grown at Lyallpur annually since then. In the first year after their arrival, the varieties were grown on land of fair quality and got the same treatment as all my other cottons, but although the seeds germinated all right, many plants died off very young. The plants that came up looked unhealthy and never reached the height of the ordinary acclimatised American cottons grown in the experimental area. The bracts and leaves of all these newly-imported cottons and the bolls of all except one of them were so very much bigger than those of our acclimatised cottons that they were glaringly noticeable to any one as being different from our varieties. An outturn at the rate of something like a maund (82 lbs) or less of *kapas* per acre was all we got from them. Since then seeds from the healthier plants only have been resown; the stand of the crop has annually become better, the bolls, bracts and leaves have diminished considerably in size, the leaves have become thinner and more hairy, and the general appearance of varieties is such that they might easily be passed now by the casual observer as one of our Dharwar or *narma* Americans. There are other interesting changes, but I will not carry the subject further as the flowers of the varieties were not bagged and self-pollinated annually and therefore it is possible that cross pollination with acclimatised varieties might have taken place. Unfortunately, it was impossible for us to bag these cottons annually and give them the close observation which I should have liked to give, as I have only had one man to help me with my cotton work during these years, and we had hundreds of sowings of other cottons to get more immediately important data from.

(2) I got a duplicate set of the same cottons from America last year, and hope to have better luck as regards staff to deal with these so as to get evidence on several questions in my mind. Meantime it is interesting that the first crop of the second lot imported has behaved exactly like the previous lot.

(3) Some American cottons brought from America to Jullundur by an Indian farmer about 1913-14 appear to have behaved similarly. I saw a small plot of these cottons in 1916. The stand was miserably thin, most of the plants were in miserable health, and the crop got must have been extremely poor. I hear that the variety has been given up altogether owing to being unprofitable. The Dharwar American cottons which were being imported into the Punjab from Dharwar in the Bombay Presidency when I came here in 1907 also contained a large percentage of sickly, poor yielding plants. Their leaves were rather bigger, thicker and less hairy than those of the old *narma* cotton (American) which had been introduced into the Punjab very many years before. The fibre of these *narmas* was also shorter and rougher than that of the Dharwars mentioned above.

(4) The dates of sowing and harvesting cottons in the United States of America correspond roughly with those of our country cottons here, and on comparing the climate of the cotton belt with that of the Punjab, we find that our temperatures are a good deal higher than the American temperatures especially in the months of April, May and June when the cotton plants are young; also that our climate is much drier than that of the American cotton-growing states. Apparently the reduction in the size of the leaf, its increased hairiness and other changes in the characters of the plants are adaptations to our hotter, drier climate. From our experiences and observations, it seems evident that cottons directly imported into the Punjab from America have always been miserable failures from the profit per acre point of view for a sufficient number of years to make people reject them as useless. It is also evident that many plants do not succeed in adapting themselves to Punjab conditions even after growing very many years here, while others lose characters of important economic value in doing so. The old Punjab *narma* American for example gave less promising results than the more recently imported Dharwar Americans did in the trials made before I joined the Department. Our results indicate that useful work in improvement of such cottons here can be done by the recognition, selection and multiplication of individual plants possessing the proper combination of character to give what is required by spinners and also increased profit per acre to farmers.

1073. *Tests after leaving the Botanical Section.*—Although on very small plots, one can make accurate estimates such characters as length and strength of lint, *kan*, etc., reliable information on such important factors as cropping powers of the types can only be got from tests on a larger scale than my facilities would admit of my making, and I have had to hand my half done work over to the agricultural section for completion. This in my opinion, has been a great defect in the organization.

1074. *Difference in gross income from unselected Dharwar and 4-F. when grown interstripped with each other.*—A test between my American selections and the ordinary *unselected Dharwars* was conducted on the agricultural farm in 1912 (see pages xii and xxiii of the Annual Report of the Agricultural Department of June 1913).

(2) Referring to this test the report states—" The different types were grown side by side with Dharwar American cotton for comparison on an area of eight acres, type 4-F averaged 10 maunds 21 seers against 6 maunds 23 seers for Dharwar."

(3) Regarding unselected Dharwar cottons and a cotton known as 3-F. grown on the farm in the experiment referred to above, Messrs. Tata and Sons, Spinners, Bombay, in their letter, dated 10th December 1912, wrote as follows :—" We have carefully examined the average sample of cotton which is for sale in the neighbourhood of Lyallpur (unselected Dharwar cotton), and we find that it is mixed with *deshi* (Indian) cotton. The fibre is irregular and weak, and we are afraid it is unsuitable for the requirements of our mills. We regret, therefore, that we are not prepared to make an offer for the same. The other sample marked 3-F. is undoubtedly a cotton of superior quality resembling fully good middling American. The fibre is strong, long and even, and appears to be even better than the cotton purchased by us last year on your side from Risalewala Farm. We value it to-day at Rs. 12¾ per maund for *kapas* at Lyallpur, say, Rs. 2 higher than the other sample which we value at about Rs. 10-1-6 or Rs. 10-1-0 per maund." Unfortunately 4-F. does not seem to have been valued on the same date, so absolute accuracy of comparison is impossible, but 4-F. has a better *kan* than 3-F. had, and there was no very great difference in the fibre, therefore if we value 4-F. at Rs. 12¼ per maund we should get a gross income within the mark. Taking Rs. 12¼ per maund as the value of the 4-F. *kapas* and lits outturn of $10\frac{21}{40}$ maunds, it yielded a gross income of Rs. 129 per acre in the experiment, while the unselected Dharwar grown along with it and yielding $6\frac{29}{40}$ maunds of *kapas* at Rs. 10-10-0 per maund, gave about Rs. 71 per acre only. The cottons being interstripped and grown on an area of eight acres give some indication of the advantage to *zamindars* of growing 4-F. instead of unselected Dharwar.

1075. *Growers' and traders' opinions of 4 F.*—What the *zamindars* think of 4 F. is shown by the fact that ... demands of growers ... ade also recognise it as ... areas sown with seed

In 1913, the area sown was 100 acres and *kapas* sold in January 1914 by auction at sales fetched Rs 9 10 0 per maund when country cotton was at Rs 6-13 0 The Agricultural Department acts as organiser of and arbitrator in those sales (*vide* Annual Report of the Department ending June 1914, page 3, paragraph 7, and dated June 1913, appendix, page XII)

In 1914, the area was over 3,000 acres and the produce fetched a premium of between Rs. 2 5-0 and Rs. 2 8 0 per maund over country cotton at the auction sales (*vide* Annual Report of the Department, June 1915, page 10, and Agricultural Journal of India, Volume XI, part III, July 1916, page 239)

In 1915, the area was over 7,700 acres and *kapas* at the sales fetched Rs. 2 8 0 to Rs 4 per maund over country cotton. A good deal of the *kapas* from the above area was also sold privately (*vide* Annual Report of the Department ending 30th June 1916, page 10, paragraph 20)

In 1916, the area was over 50,000 acres The Professor of Agriculture writes that as much as Rs. 17-1-0 per maund of *kapas* was obtained for some lots of 4 F. in November 1916 when the price of country cotton here was only Rs 8 to Rs. 9 per maund (*vide* Annual Report of the Department, dated June 1917, page 8, and Agricultural Journal of India for July 1917, page 491)

... In the second

... and some reasons for this.—The net result

...

advance to a large area when a type more suitable to the country has been produced.

... to compare the keenness of *zamindars* to-day to grow American cottons with their ... port, and ... *y opinion,* ... the health ... nt heredi- ... the crop yielded by those left by a very large amount straight away. The next step was the ... select and ... characters which would yield increased profits to growers ... cter as the ... as we have ... ere cottons ... er from the ... continued ... and not on ... d quite in ... Professor

of Agriculture that, in 1916, a total of 120,000 acres of American cotton were grown in the Punjab, while the Agricultural Department supervised the growing and arranged for the sales of the produce of only 30,000 acres. An area of 90,000 acres or three-quarters of the whole area under American cottons in the Province was therefore apparently grown simply because the types of American cotton now available to growers have been consistently yielding more profit than their country cottons were. Regarding extra profits, the Professor of Agriculture states that the ordinary premium for American cotton in 1916 apart from sales arranged by the Agricultural Department was Rs. 4 per maund, and taking six maunds per acre as the average crop calculates 120,000 × 6 × 4=Rs. 28,80,000 as the extra profit got by cultivators by growing American instead of *deshi* cotton (*vide* Agricultural Journal of India, dated July 1917, page 491). This estimate, however, must be very much below the mark, for it does not take into consideration the fact that the selected American cottons simply growing in fair agricultural conditions yield a greater number of maunds per acre than the ordinary unselected *deshi* cottons do in similar conditions. This is obvious from our own work on the experimental lands and from what one sees on tour in the districts when one comes across plots of American and ordinary *deshi* cottons growing side by side. Also the *zamindars* who grow American cotton all agree on this point. In my opinion, if selected American and ordinary unselected *deshi* cottons are grown over a large area of fair quality of lands receiving fair cultivation, the excess of the selected American over the unselected *deshi* would be two maunds per acre approximately. The fact that American cotton comes rather later into flower than *deshi* and has a longer picking season, has accentuated this difference in its favour on several occasions. For example, in 1911, when boll-worm caused very severe damage, much more crop was got from the American cottons than from the *deshi*, although both appeared about equally severely attacked when the attack was raging. The attack was stopped by a very heavy wind and rainstorm which caused affected buds and fruits to fall off the plants into the sea of water at their bases, and as this occurred after the *deshi* varieties had produced the majority of their flowers, they yielded very little crop while the American plants formed a considerable crop of flowers and bolls after that storm.

(3) In 1915, excessive heat and drought in the early summer caused a very large number of early formed flowers and bolls to fall off cotton plants, and the *deshi* crop suffered more than the American owing to its earlier and shorter flowering season as it has a larger proportion of its total crop on the plants at that time. In the past summer (1917), excessive rains caused a very large number of flowers to fall from both *deshi* and American cottons and again the American crop will give much better outturns than the *deshi* for the same reason as before.

(4) As harvesting of American cotton extends to later in the year than in the case of *deshi*, American cotton requires an extra watering or more after watering for *deshi* is unnecessary in order to get the best results, but the past phenomenal rate of spread of American cotton-growing here shows that this will not be an effective deterrent to *zamindars* growing it in preference to *deshi* so long as they get more money value out of it. Even if no extra watering is given, however, he will still get some crop late in the season, although the quality of the lint may not be so good, and as he can sell even this lint in the market for as good or a better price than he can get for *deshi*. Doubtless this also weighs with him.

(5) I think events have shown that *zamindars* here are quite keen enough to grow more profit-yielding cottons when they can get hold of them, and it seems to me important that arrangements be developed for providing a steady and sufficient annual supply of good seed to growers, and that work on improving the types to be sent out should follow the general principles adopted in evolving the types already evolved.

1078. *A comparison of the values of the lints of Punjab American cottons with those of other cottons, also a few other characters.*—As already stated in paragraph 1069 samples of lint of our selections have been kindly valued for us by Messrs. Tata and Sons, Bombay, the British Cotton Growing Association, Liverpool, or other bodies repeatedly since 1909-10. They have frequently reported that the lints sent from quite a number of our selections are suitable for Lancashire. In these years, they have valued a number as equal to middling American and a few as better than that grade.

(2) The following table shows the spinning counts and the prices per *khandi* of eight of these selections as reported by Messrs. Tata and Sons, after valuation of samples sent to them in 1917. I have added columns showing the length of lint and *kan* :—

Selection.	Length of lint.	*Kan.*	Spinning counts.	Price per *khandi of* 784 lb.
				Rs.
161-AF	1″	31	30 to 40	580
280 F	1·1″—1·2″	28	50	650
281-F	1·0″—1·1″	29	44	630
282-F	1·1″	29	50	650
285-F	1·2″	32	50	650
286-F	1·2″	29	50	665
287-F	1·0″—1·1″	31	48	650
288-F	1″	29·5	48	640

Many other samples were valued between Rs. 570 and 630. Messrs. Tata and Sons report that, on the date of valuation, Sind American was selling at Rs. 530, American Middling spot Liverpool at 19*d* per lb., F. Navasari at Rs. 600, F. Surat at Rs. 570, Cambodia at Rs. 550 and F. Broach at Rs. 550 per *khandi*. Samples from

four of these selections were also sent to the British Cotton Growing Association, and their report, dated 27th September 1917, *includes the following:*—

Mark.	*Quantity*	*Classification, etc.*	*Value*
No 280 F.	Sample A*	Equal in grade to Fully Good Middling Boweds, very bright creamy, good staple. (Useful cotton)	About 80 to 90 on
No. 280 F.	Sample B*	Equal in grade to Mid Fair Boweds, good colour, staple smooth, strong, about 1 inch in length, very desirable cotton	About 175 on
No 282 F.	..	Equal in grade to Mid Fair Boweds, very white and bright, staple about 1 inch in length, inclined to be a little rough, very desirable cotton	About 150 to 170 on
No. 285 F.	..	Equal in grade to Mid Fair Boweds, very bright, good colour, staple strong smooth full 1⅛ to 1$\frac{3}{16}$ inch in length, very desirable cotton	About 250 on
No. 2±6 F	.	Equal in grade to Mid Fair Boweds, rather creamy, staple rough strong, full 1⅛ to 1$\frac{3}{16}$ inch in length, very desirable cotton	About 250 to 300 on

Price of Middling American 18 62*d*

1079 *Start of the work on Indian cottons* —I may now ...
Indian cottons I started my work on these cottons in 1908, and my plan of work on these was as described
... things prevented
...
... different types of
...
... bility of combining characters of
... of what

*Note —Sample A 280 F is from a picking made on 14th November 1916 and sample B 280 F is from the same cotton, but picked on 4th December 1916

MULTAN.

The Multan District has just been surveyed. The survey shows that *G. sanguineum* red flowered broad leaved type forms 39·45 per cent. *G. sanguineum* red flowered narrow leaved 0·78 per cent. *G sanguineum* pink flowered broad leaved 9·65 per cent., *G. sanguineum* pink flowered narrow leaved 2·3 per cent., *G. indicum* yellow flowered 36·52 per cent., *G. indicum* white flowered 2·57 per cent., *G. neglectum* yellow flowered 0·87 per cent., *G. neglectum* white flowered 0·10 per cent. and *G. hirsutum* (American) 0·83 per cent. of the crop of the whole district. *G. sanguineum* red flowered broad leaved formed from 32·46 to 48·81 per cent. and *G. indicum* yellow flowered from 33·0 to 45·66 per cent. of the crop in the different *tehsils*. *G. hirsutum* formed 19·43 per cent. of the crop in Kabirwala Tehsil, 8·46 per cent. in Mailsi Tehsil and one per cent. or less in the others.

In the Multan survey, a pleasing feature was the large amount of pure acclimatised American cotton which is being grown by the colonists on the lands brought under cultivation by the new canal known as the Lower Bari Doab. This cotton is doing exceedingly well there this year. Its crop will be much heavier than that from the *deshi* cottons.

1086. *Some differences in cotton cultivation noticed during the cotton surveys.*—I may mention here, however, that during these surveys, it has been very noticeable that the crops on lands irrigated by wells are exceptionally well cultivated and very good. This is probably due partly to the fact that the holdings are small and the crop must be well attended to in order to provide a living for the family but it is probably mainly due to these people having to spend a great deal of time and labour in lifting their irrigation water from the wells making them careful to preserve their soil moisture as far as possible by interculture of the crops, etc.

(2) On canal irrigated areas, the crops are sometime moderately well cultivated. At other times, they are more or less neglected and overrun with weeds. This is worst where the farmers are tenants on the *batai* (crop share) system and they are keen on rearing cattle. In such cases the grass and weeds which grow among the cottons form cattle fodder of which the landlord gets no share and although the cotton crop got is small, the tenant recoups himself on his cattle. Indeed in some cases the whole aim of these people seems to be the rearing of cattle. In such cases they frequently sow fodder crops such as *juar* (*Sorghum bulgare*), *savank* (*Panicum colonum*), *mandwa* (*Eleusine corocana*), etc., for which the landlords usually get no *batai* among their cotton crops. This sort of thing is most frequently seen in the districts of Shahpur, Jhang and Multan, especially on inundation canals where the holdings are large. Tenants on these lands are often people who lived by rearing cattle before canals were so common. These tenants and also the landlords who own those lands require to be taught agriculture before good American cottons lints can be grown there. The conditions on which the land is let also should be altered to compel tenants to grow fodder crops separately which will harm the cotton crop and to provide, as far as possible, incentives for clean and thorough cultivation.

(3) Lands irrigated by canals are very seldom as well cultivated as those irrigated by wells. One reason for this seems to me to be that, while the farmer on well lands evidently tries to increase his crop by interculture, so as to save irrigations which cost him much, the farmer on canal lands tries to save the expenses of the labour of interculture and to increase his crop by extra waterings for which he has nothing extra to pay to the canal authorities. Some system of distributing canal water is required by which it will be to the farmer's interest to conserve the moisture in his fields. In this connection, the feasibility of charging farmers for water by volume which I understand is already being experimented on by the Canal Department, appears to me a matter of great importance in the question of cotton growing. The harmful effects of over irrigation and the beneficial effects of interculture should also be demonstrated to *zamindars* on all possible occasions and on their own lands when practicable.

1087. *Some varieties of cotton tried in the Punjab since 1907, which have failed.*—*Garo Hill Assam Cotton* (*G. cernuum Tod.*) was tried for several years here but although the *kapas* had a *kan* up to fifty per cent. and it hung out of the bolls in such huge masses that it could be harvested with a minimum of trouble with little or no leaf or dirt in it, the stand of the crop was always so poor and the number of bolls per plant so few that it is the worst annual Indian cotton from the farmer's point of view that I have tried here.

(2) *Buri cotton* seeds were procured from the Central Provinces in 1907. This is a type of American cotton (*G. hirsutum*) which was, I understand, acclimatised in Bengal. It differed from the ordinary Upland American grown here in requiring a much longer season to mature. The lint was good. The variety was tried at Lyallpur for two succeeding years but although the plants grew lustily, they came into flower far too late, and the crop of *kapas* was so small that for all practical purposes, it was a failure. In the second year of trial, in order to see the effect of earlier sowing, I put down sowings at intervals of two weeks from the end of February till late April but the result was the same as before as regards the date of coming into flowers and crop got. The variety was therefore discarded.

(3) *Cambodia cotton* which looked like another strain of the same cotton as *buri* was got from the Central Provinces in 1910 and was tried sown at the same time as the ordinary cotton crop here The results were practically the same as in the case of *buri*. Since then Cambodia has been tried at Gurdaspur near the base of the Punjab Himalayan hills by the Deputy Director of Agriculture, Gurdaspur. The results got were similar to those I got at Lyallpur.

(4) *The Egyptian cottons*, Metafiffi, Ashmouni, Abbassi and Yannovitch were got from the Khedivial Agricultural Society, Egypt, and tried at Lyallpur for several years but the plants were unhealthy and the crops of *kapas* got were most miserable.

(5) *Two African cottons* named *Beni* and *Niger* were at Lyallpur when I arrived. The plants grew to great sizes but were even later than *buri* and Cambodia and gave scarcely any *kapas* at all.

(6) *Caravonica and Spence Tree cottons*, also at Lyallpur when I arrived, were grown for several years. The plants grew luxuriantly but flowers always appeared too late in autumn to allow even a small crop of *kapas* to be got. They were quite useless.

1088. *The most important diseases of cottons in the Punjab.*—A *bollworm* which is the larva of the moth (*Earias insulana*) does a lot of damage to flower buds and bolls in some years. A parasite (*Rhogas lefroyi*) on the bollworm is bred by the Agricultural Department and issued to needy districts in years when the disease is bad. Rains in June and July are believed to check the bollworm materially. Severe winters are believed to increase the pest in the following season by killing off the parasite in large numbers while not killing the bollworms to the same extent. The crops of cotton least damaged by bollworm are therefore expected after a mild winter and good rains in June and July. The pest is also checked by plucking off and destroying the earliest formed flower buds. A note on what is known about cotton bollworm in the Punjab

was written by Lala Madan Mahan Lal, Assistant Professor of Entomology, Agricultural Department, Punjab in 1913 which should be consulted

[illegible]

"We have tentatively called it *Empoasca gossypii* and have asked Mr W L Distant in the *British Museum London to adopt the name suggested and to incorporate the description in* the Fauna of British India Series

[illegible]

[illegible] to be closely bound up with liability to [illegible] attack but we think we have got

practically immune but, in the past year, [illegible]
to hurt their cropping powers.

[illegible]

Statement of cottons handed over to the Professor of Agriculture for testing on a field scale

Serial No	Variety No	Class		Year of handing over	Remarks
		American	*Deshi*		
1	266 F	*Narma*		1909	Discarded in 1910 Said to be a poor yielder on the Agricultural Farm It gave 12 maunds 5 seers per acre in the Botanical Section on a ¼ acre plot in 1908 and it gave 10 maunds 4 seers, per acre in 1909 on a 1¼ acre plot on the Agricultural Farm In 1910 it gave 6 maunds 35 seers as compared to *deshi* [illegible]
2	267 F	Dharwar		1909	[illegible]
3	29		*G indicum* (Lyallpur *deshi*)	1909	[illegible]
4	199 F *alias* 3 F	Dharwar		1910	[illegible] *zamindars*
5	270 F *alias* 4 F	*Narma*		1910	This is 4 F
6	26		*G neglectum* (Maler Kotla cotton)	1910	[illegible] was sent to the Agricultural Depart[illegible] a good [illegible]tanical [illegible] came [illegible] field [illegible] is was done

(2) Meantime it is interesting to note that the little information to my hand indicates that long-stapled cottons in America come from lands which have naturally damp subsoils, while the shorter rougher varieties come from the drier uplands; also that Mr. W. L. Balls, formerly Botanist to the Khedivial Agricultural Society, Egypt, in his book "The development and properties of raw cotton," which has been read by me during the past few weeks, comes to the conclusion that length or strength of lint is degraded by water shortage. Our 4 F. selection is a comparatively short-linted cotton (about 0·9 inch), and since the unsatisfactory effects of growing American cotton on the sandy strip of land in my area attracted my attention some years ago, I have often wondered how far the longer-linted cottons which I have on hand will be grown with success by ordinary *zamindars*. Trials of these on various classes of lands and under various conditions of cultivation and irrigation are urgently necessary.

1094. *Zamindars should be warned as to what happens when cottons are grown on sandy lands, and such areas should be marked.*—Even with the experiences which I have already had, it seems to me essential that the larger areas of sandy lands should be marked out at once as unsuitable for growing long-stapled cotton of good quality, and that all farmers should be warned to look out for any such areas on their farms. It should be noted that the roots of cottons have been followed down to about nine feet, and that although a soil may be sandy on the surface it may be of excellent loam or stiff clay well within the feeding area of the cotton roots and so, when regularly watered, may produce excellent cotton. Again a soil may be stiff clay for a foot or so on the surface and may be so excessively open and drained below that depth that it will hold practically no water at all. There are probably some areas of considerable size in the province which could be marked off as unsuitable at once, but there will be smaller streaks like the one in my own lands which must also be ruled out if a uniform staple is to be got, and to begin with, at least, it seems to me that the most practical thing to do is to warn *zamindars* of what happens to American cottons on such lands and try to persuade them either not to grow them on these, or to keep the *kapas* separate if they do so. Maps showing such areas and streaks would be of use to the Agricultural Department and others interested in the cotton trade.

1095. *Need for a special officer on each important crop in the Province.*—Every person I meet considers himself quite fit to select and test crop varieties, and there is a general feeling that even the most uninitiated has a gambler's chance of hitting on something which will make a name for himself and therefore many people are anxious to try their hands at it. An absolute novice may, however, collect more selections or make more crosses in a single afternoon than could be properly tested in ten years. I personally had not gone very far with my crop improvement work before I discovered that it was absolutely necessary to put men to work exclusively on each important crop if real progress was to be made and we were to avoid the waste of large amounts of money and time. Experience of ten years has only confirmed this view.

(2) I feel that the time will soon come when there will be an officer with a properly equipped staff and other facilities here, whose special duties will be the improvement of cottons in the province, and that his duties will include all those from selection and crossing work to distribution of seed and marketing of the crop. He would have to have the qualifications of an Economic Botanist coupled with an agricultural training. There will also be a similar provision, I think, for each important crop. Such an arrangement would get clear away from dual control with all its evils and would give the province the full benefit of any special knowledge acquired, while the great driving forces of ambition and self-interest would all be directed to helping on the work. As crops like cotton and wheat are grown at different times of the year, several of these officers could work on the same farm. For co-ordination of the work they should be placed under an officer whose title might be "Chief of the bureau of plant industry." The members of the agricultural section would have their own special work of improving implements, methods of cultivation, distribution and conservation of water, manurial and rotational experiments, dairying work, etc., etc.

1096. *Suggestions for arrangements as to land and field staff which might be made now.*—If the special staff and facilities above mentioned cannot be arranged for at present, I would suggest that the Economic Botanist be allowed to test his types to a finish himself. This would avoid much of our difficulties. He would require a farm of about 300 acres for this purpose. There is a certain proportion of the agricultural farm at Lyallpur at present reserved for testing the Economic Botanist's cottons and wheats, and this might be handed over to the Economic Botanist for that work. Further additions of land might be given him as early as possible. Practically all the time I have been in the Punjab, I have only had one assistant to help me with my work on cottons, one for my work on wheats and one to be my farm manager, my store-keeper and to attend to all my experiments on other crops. It has therefore been impossible for me to investigate many points which our work has brought to view simply on account of want of staff. A Research Assistant whose special work would be on cottons is urgently required. His qualifications like those of all men on research work should be the highest possible. Other staff necessary for the farm would also be required.

1097. *The Economic Botanist to test his types on zamindars' lands when necessary.*—It seems to me important that the Economic Botanist—who after all is the man who suffers or gains by the behaviour of a variety when it gets out to growers—should have permission to test his varieties on *zamindars'* lands when he finds that helpful to the work. This concession would have many advantages. For example, had I had a few acres of my longest linted cottons on selected *zamindars'* lands during the past year or two, I could have made more definite statements now on the possibilities of growing good even lint of long-stapled cotton in the Punjab. Again if there is insufficient room on the botanical section lands to test all the varieties ready, this concession would prevent blocking of the progress of the work from want of land. Some such arrangement could be made with *zamindars* as that which I have worked with satisfaction to all concerned in the case of the introduction of Scotch potatoes in the Simla hills. When I started that case, I promised that if my crop did not yield as much money per acre as the local crop on the same lands, I would make up the difference to the growers, while if it yielded more money I would allow them to keep the difference. I reserved the right to buy back the produce if desired at market rates. For cotton work a small budget allowance could be set aside to meet any expenses which might turn up. *Zamindars* are more than ready to accept these terms, and as my areas would be small and, for my own sake, I am not likely to try varieties which do not give promise of being at least better than the local varieties, unless I have a special object in view there is little chance of these experiments costing Government much money. If my tests showed that a variety is unsuitable, I could buy the crop back at market rates and sell it again where the seed will be used for commercial instead of reproductive purposes. *Zamindars* are, however, very keen to grow types of cotton which will yield them the largest profit obtainable, and they would be only too glad to drop from cultivating any type which does not do so. On the other hand, as soon as any type does show itself better than others available nothing would so well pave the way for the distribution of its seed by the department.

1098 *Suggestions regarding office* [illegible]
Agricultural Chemist and Professor [illegible]

seed got two years previously and so on.
(2) Some advantages of this system are—

(1) That pure seed of a good variety could be distributed over a large area with great rapidity
(2) If the type should prove not very suitable for particular conditions a grower would have experience of the crop before it occupied a large area of his farm
(3) The seed will be off the farm before it gets very much crossed

zamindars and people interested in these in order to keep himself in touch with what is wanted and to exp[illegible] or show what he has coming forward I think there has been a tendency in the past to keep the agricultural [illegible]

—Zamin[illegible]
[illegible]dy lands,
fibre with
[illegible] Punjab

better cottons on the mark[illegible]
keep the grades separate f[illegible]

body concerned Mr Pearse approved of the idea and said [illegible]
land up After consulting the Professor of Agriculture, the Director of Agriculture, and his own committee,

(2) Meantime it is interesting to note that the little information to my hand indicates that long-stapled cottons in America come from lands which have naturally damp subsoils, while the shorter rougher varieties come from the drier uplands; also that Mr. W. L. Balls, formerly Botanist to the Khedivial Agricultural Society, Egypt, in his book "The development and properties of raw cotton," which has been read by me during the past few weeks, comes to the conclusion that length or strength of lint is degraded by water shortage. Our 4 F. selection is a comparatively short-linted cotton (about 0·9 inch), and since the unsatisfactory effects of growing American cotton on the sandy strip of land in my area attracted my attention some years ago, I have often wondered how far the longer-linted cottons which I have on hand will be grown with success by ordinary *zamindars*. Trials of these on various classes of lands and under various conditions of cultivation and irrigation are urgently necessary.

1094. *Zamindars should be warned as to what happens when cottons are grown on sandy lands, and such areas should be marked.*—Even with the experiences which I have already had, it seems to me essential that the larger areas of sandy lands should be marked out at once as unsuitable for growing long-stapled cotton of good quality, and that all farmers should be warned to look out for any such areas on their farms. It should be noted that the roots of cottons have been followed down to about nine feet, and that although a soil may be sandy on the surface it may be of excellent loam or stiff clay well within the feeding area of the cotton roots and so, when regularly watered, may produce excellent cotton. Again a soil may be stiff clay for a foot or so on the surface and may be so excessively open and drained below that depth that it will hold practically no water at all. There are probably some areas of considerable size in the province which could be marked off as unsuitable at once, but there will be smaller streaks like the one in my own lands which must also be ruled out if a uniform staple is to be got, and to begin with, at least, it seems to me that the most practical thing to do is to warn *zamindars* of what happens to American cottons on such lands and try to persuade them either not to grow them on these, or to keep the *kapas* separate if they do so. Maps showing such areas and streaks would be of use to the Agricultural Department and others interested in the cotton trade.

1095. *Need for a special officer on each important crop in the Province.*—Every person I meet considers himself quite fit to select and test crop varieties, and there is a general feeling that even the most uninitiated has a gambler's chance of hitting on something which will make a name for himself and therefore many people are anxious to try their hands at it. An absolute novice may, however, collect more selections or make more crosses in a single afternoon than could be properly tested in ten years. I personally had not gone very far with my crop improvement work before I discovered that it was absolutely necessary to put men to work exclusively on each important crop if real progress was to be made and we were to avoid the waste of large amounts of money and time. Experience of ten years has only confirmed this view.

(2) I feel that the time will soon come when there will be an officer with a properly equipped staff and other facilities here, whose special duties will be the improvement of cottons in the province, and that his duties will include all those from selection and crossing work to distribution of seed and marketing of the crop. He would have to have the qualifications of an Economic Botanist coupled with an agricultural training. There will also be a similar provision, I think, for each important crop. Such an arrangement would get clear away from dual control with all its evils and would give the province the full benefit of any special knowledge acquired, while the great driving forces of ambition and self-interest would all be directed to helping on the work. As crops like cotton and wheat are grown at different times of the year, several of these officers could work on the same farm. For co-ordination of the work they should be placed under an officer whose title might be "Chief of the bureau of plant industry." The members of the agricultural section would have their own special work of improving implements, methods of cultivation, distribution and conservation of water, manurial and rotational experiments, dairying work, etc., etc.

1096. *Suggestions for arrangements as to land and field staff which might be made now.*—If the special staff and facilities above mentioned cannot be arranged for at present, I would suggest that the Economic Botanist be allowed to test his types to a finish himself. This would avoid much of our difficulties. He would require a farm of about 300 acres for this purpose. There is a certain proportion of the agricultural farm at Lyallpur at present reserved for testing the Economic Botanist's cottons and wheats, and this might be handed over to the Economic Botanist for that work. Further additions of land might be given him as early as possible. Practically all the time I have been in the Punjab, I have only had one assistant to help me with my work on cottons, one for my work on wheats and one to be my farm manager, my store-keeper and to attend to all my experiments on other crops. It has therefore been impossible for me to investigate many points which our work has brought to view simply on account of want of staff. A Research Assistant whose special work would be on cottons is urgently required. His qualifications like those of all men on research work should be the highest possible. Other staff necessary for the farm would also be required.

1097. *The Economic Botanist to test his types on zamindars' lands when necessary.*—It seems to me important that the Economic Botanist—who after all is the man who suffers or gains by the behaviour of a variety when it gets out to growers—should have permission to test his varieties on *zamindars'* lands when he finds that helpful to the work. This concession would have many advantages. For example, had I had a few acres of my longest linted cottons on selected *zamindars'* lands during the past year or two, I could have made more definite statements now on the possibilities of growing good even lint of long-stapled cotton in the Punjab. Again if there is insufficient room on the botanical section lands to test all the varieties ready, this concession would prevent blocking of the progress of the work from want of land. Some such arrangement could be made with *zamindars* as that which I have worked with satisfaction to all concerned in the case of the introduction of Scotch potatoes in the Simla hills. When I started that case, I promised that if my crop did not yield as much money per acre as the local crop on the same lands, I would make up the difference to the growers, while if it yielded more money I would allow them to keep the difference. I reserved the right to buy back the produce if desired at market rates. For cotton work a small budget allowance could be set aside to meet any expenses which might turn up. *Zamindars* are more than ready to accept these terms, and as my areas would be small and, for my own sake, I am not likely to try varieties which do not give promise of being at least better than the local varieties, unless I have a special object in view there is little chance of these experiments costing Government much money. If my tests showed that a variety is unsuitable, I could buy the crop back at market rates and sell it again where the seed will be used for commercial instead of reproductive purposes. *Zamindars* are, however, very keen to grow types of cotton which will yield them the largest profit obtainable, and they would be only too glad to drop from cultivating any type which does not do so. On the other hand, as soon as any type does show itself better than others available nothing would so well pave the way for the distribution of its seed by the department.]

... of years back the offices of the Economic Botanist, ... have been

... annot usually get a ... cases I simply have ... k the accounts work ... another clerk to keep

... cotton ... to ... organisation it is necessary ... The system which I ... vised, is that a grower ... eld him sufficient seed ... ation multiply at the ... xt season and for 400 ... d have one acre sown with fresh seed, ... res or more sown with seed got two years previously and so on.

(2) Some advantages of this system are—

(1) That pure seed of a good variety could be distributed over a large area with great rapidity.

(2) If the type should prove not very suitable for particular conditions, a grower would have experience ... of his farm

... uainted during my youth in connec-

... t amounts of ... keep them ... or can mid- ... r cotton are ... par- ... ore, ... his ... ght ... rice ... they ... ring ... trict ... ure, ... and ... the

... and, ... urts ... otton ... the ... and ... ities ... Any-

... roved ... posed ... vers, when he met me ... ssociation, ... nments of ... to every- body concerned ... o take the land up. After consulting the Professor of Agriculture, ... and his own committee,

he entered into negotiations with the Punjab Government to lease 10,000 acres of land in Montgomery District. Unfortunately the scheme did not come to fruition.

(2) My opinion was that a large spinning concern, growing cotton in our midst, would be the greatest help to *zamindars* as it would be to its interest to encourage the growing of better class of cottons. Being spinners, the concern would be in a position to give to growers the very highest prices for good cottons without loss to its members as no middleman's profits would have to be deducted. If, however, Government wants to take a really effective hand in improving the cottons of the province, the lands should be farmed, I think, by the Cotton Specialist of the Agricultural Department. Small quantities of good *kapas* grown by *zamindars* could then be added to the specialist's lots just as would be the case if spinners farmed the lands. The lots could be sent direct to spinners. At any rate, the specialist should farm a large area of land so as to be able to issue substantial amounts of seeds to *zamindars* annually and to carry on cotton improvement work properly in all its phases. All means by which growers and spinners may be brought more closely in contact should be carefully sought after.

1104. *The Agricultural Department to keep spinners informed as to the amounts and grades of cottons available.*—I think it would be helpful if the Agricultural Department could keep spinners well informed as to the probable amounts and grades of cotton that could be had here if they were kept separate. The annual returns of the area and purity of American and *deshi* cottons—kindly started for us at my request the year before last by the Canal Department—should be helpful as regards information on American cottons as nearly all the American cottons are grown on canal irrigated lands. The form being filled up for us is headed as follows :—

Area in *kanals* containing 5 per cent. *deshi* plants or less.	Area in *kanals* containing 6–10 per cent *deshi* plants.	Area in *kanals* containing 16—25 per cent. *deshi* plants.	Area in *kanals* containing 26 to 35 per cent. *deshi* plants.	Area in *kanals* containing 36 to 50 per cent. *deshi* plants.	Area in *kanals* containing over 50 per cent. *deshi* plants.

Notf.—One *kanal*=one-eighth acre.

(2) Samples of lint might also be sent to the principal cotton buying bodies. It would be for spinners to decide whether they want these grades; and, if so, to see that *zamindars* get such offers for them as will repay them to sell these separately. If *zamindari* banks would combine, distribute seeds amongst their members, arrange their own ginning and send good grade consignments of cotton direct to spinners, so much the better. Meetings of representatives of spinners and growers would, I think, result in showing up just what methods of dealing are practicable and advantageous to both parties.

1105. *Suggestion for spinners to buy cottons on certificates granted by a recognised testing house.*—It seems to me that if spinners could buy their cottons on a certificate showing blowroom waste, spinning counts, breaking strain of yarn and other characters of value on standard set machinery they would be in a position to offer the maximum price to growers for their cottons with safety to themselves. In such a case, sellers of dirty, mixed, or adulterated cottons would receive a correspondingly poor price for their wares, and as wilful mixing and adulteration would no longer be a paying business to those who practise these, they would soon cease. Huge sums of money would thus be saved which are now spent in cleaning needlessly dirty or mixed cottons. The natural incentives would then be in the direction of obtaining strains pure and of as good quality as possible and the nation would receive the benefit of these. Legislation to enforce the production of certificates showing analysis of the above nature would be required before this method of purchase by spinners would come into practice. These certificates would have to be granted by a recognised and properly equipped testing house.

(2) Local buyers being on the spot could protect themselves without such certificates, and they seem most necessary in the case of the spinners. The ginner, I think, should have to produce these as he could be responsible for what goes into his bales. A 100 lbs. sample would be required for a test on which to grant the certificate. Ordinary spinning mill machinery which would deal with the fibre up to and including spinning would be necessary. About six samples could be dealt with, I understand, per day on such a set of machinery. There are about 140 ginneries annually working in the Punjab, and, if each factory sent one sample, it would therefore take about 24 days to deal with them all, while four sets of such machines could deal with a sample from each ginnery per week. As one set of opening and cleaning machinery could deal with about 1,200 lbs. of cotton per day, fewer of these particular machines would be necessary in such a case. The testing work would only extend over a few months of the year, therefore it might be economic to run the testing house as a small spinning mill for the remainder of the year or have it run in connection with a technical institute. The cost of the machinery and of working it would not be a fraction of the amount of money gained by such a system of testing. The house might either be organised and run by those interested in the cotton trade or by Government. The certificate granted from this house could also state the amount of moisture, salt, etc., in the samples thus overcoming difficulties with regard to these matters at the same time.

1106. *Legislation regarding branding of bales.*—I should also like it to be made law that all bales of cotton should bear the name and address of the ginner and of the ginnery in which the cotton is ginned, fraudulent marking being penalised. This in itself would, I think, do much to stop cotton from one part of India being sold as cotton from another.

(2) The names on the bales would become a sort of trade mark bearing a certain value in the market, and those dealers who mix their cottons would soon become known and marked. They would be offered less by spinners for their wares, and would therefore be unable to offer growers as good prices for their cotton as honest dealers. Consequently they would have either to discontinue their practices or leave the market. The markings on the bales should be done in such a way that they cannot be transferred from one bale to another. At present private marking done on the cloth enveloping the bale is sometimes transferred by removing the piece of cloth bearing the mark and sewing it on to another bale.

ANNEXURE

Meteorological Data for ten selected Stations in the Punjab

Average rainfall recorded at ten Meteorological stations in the Punjab

Station	Elevation above sea level, in feet	January: Number of rainy days	January: Rainfall in inches	February: Number of rainy days	February: Rainfall in inches	March: Number of rainy days	March: Rainfall in inches	April: Number of rainy days	April: Rainfall in inches	May: Number of rainy days	May: Rainfall in inches	June: Number of rainy days	June: Rainfall in inches	July: Number of rainy days	July: Rainfall in inches	August: Number of rainy days	August: Rainfall in inches	September: Number of rainy days	September: Rainfall in inches	October: Number of rainy days	October: Rainfall in inches	November: Number of rainy days	November: Rainfall in inches	December: Number of rainy days	December: Rainfall in inches	Total: Number of rainy days	Total: Rainfall in inches
Delhi	718	2 40	[illegible]	1 40	0 71	1 50	0 50	0 90	0 21	2 20	0 72	4 10	3 41	9 20	8 48	9 30	8 52	4 10	3 61	0 60	0 06	0 30	0 11	1 10	0·53	37 10	[illegible]
Sirsa	662	1 50	0 84	1 10	0 33	1 10	0 32	0 60	[illegible]	1 60	[illegible]	3 20	1 79	5 00	4 14	4 80	3 87	3 20	1 74	0·40	0 11	0 10	0 01	0 80	0·31	23 40	14 43
Ambala	89	2 80	1 62	[illegible]	2 41	1 40	0 37	0 90	0 31	1 70	0 73	4 30	6 29	9 80	7 65	7 90	8 03	3 90	4 24	0 40	0 03	0 30	0 46	[illegible]	0 82	36 90	[illegible]
Ludhiana	812	[illegible]	1 84	2 40	[illegible]	1 70	0 79	1 00	0 71	1 60	0 61	3 50	3 02	7 60	9 27	7 30	6 35	3 40	3 61	0 50	0 33	0 0	0 06	0 00	0 78	52 0	28 67
Lahore	[illegible]	1 90	1 12	2 20	1 10	1 70	0 65	1 00	[illegible]	1 50	0 82	2 30	2 09	3 30	5 96	5 20	5 30	[illegible]	1 99	0 40	0 0	0 0	0 07	0 90	0 38	[illegible]	[illegible]
Sialkot	830	3 40	2 51	3 50	1 80	2 90	1 14	1 90	0 80	2 30	1 03	3 60	3 09	9 00	8 01	8 40	9 69	3 30	2 83	1 00	0 25	0 30	0 09	1 10	[illegible]	40 70	31 75
Rawalpindi	1 674	4 20	2 74	4 40	[illegible]	4 20	1 89	3 20	1 0	3 00	1 47	3 30	2 01	9 10	8 53	8 00	8 70	4 0	[illegible]	1 30	0 44	0 80	0 29	1 60	0 74	47 30	33 98
Khushab	612	1 50	0 82	1 80	0 69	1 70	1 13	1 60	0 62	1 20	0 78	1 50	1 72	3 50	[illegible]	2 80	2 73	1 60	0 54	0 0	0 01	0 30	0 02	0 40	0 54	18 00	14 12
Montgomery	5 9	1 30	0 84	1 30	0 67	1 20	0 35	0 0	0 13	1 00	0 27	2 00	1 14	3 20	2 48	[illegible]	2 09	1 30	0 87	0 10	0 03	0 20	0 06	0 60	0 42	16 10	[illegible]
Multan	420	1 10	0 45	1 20	0 43	[illegible]	0 39	0 70	0 10	0 80	0 30	1 10	0 62	[illegible]	2 41	[illegible]	[illegible]	0 70	0 32			0 10	0 07	0 0	0 19	[illegible]	7 30

Average humidities recorded at ten Meteorological stations in the Punjab

Station	…uary: 8 A M in inches of mercury	…uary: Cloud amount, 8 A M	March: Mean humidity at 8 A M	March: Mean vapour tension at 8 A M in inches of mercury	March: Cloud amount, 8 A M	April: Mean humidity at 8 A M	April: Mean vapour tension at 8 A M in inches of mercury	April: Cloud amount, 8 A M	May: Mean humidity at 8 A M	May: Mean vapour tension at 8 A M in inches of mercury	May: Cloud amount, 8 A M	June: Mean humidity at 8 A M	June: Mean vapour tension at 8 A M in inches of mercury	June: Cloud amount, 8 A M	July: Mean humidity at 8 A M	July: Mean vapour tension at 8 A M in inches of mercury	July: Cloud amount, 8 A M	August: Mean humidity at 8 A M	August: Mean vapour tension at 8 A M in inches of mercury	August: Cloud amount, 8 A M	September: Mean humidity at 8 A M	September: Mean vapour tension at 8 A M in inches of mercury	September: Cloud amount, 8 A M	October: Mean humidity at 8 A M	October: Mean vapour tension at 8 A M in inches of mercury	October: Cloud amount, 8 A M	November: Mean humidity at 8 A M	November: Mean vapour tension at 8 A M in inches of mercury	November: Cloud amount, 8 A M	December: Mean humidity at 8 A M	December: Mean vapour tension at 8 A M in inches of mercury	December: Cloud amount, 8 A M
Delhi	282	3 7	49	[illegible]	3 0	36	373	[illegible]	38	490	2 4	56	[illegible]	5 0	75	870	6 3	78	861	6 7	69	[illegible]	[illegible]	50	[illegible]	0 8	52	287	1 4	61	[illegible]	[illegible]
Sirsa	[illegible]	4 1	57	354	[illegible]	39	302	[illegible]	37	491	9	51	710	4 5	67	857	5 9	71	855	4 7	64	7 3	[illegible]	50	400	0 7	59	[illegible]	1 9	69	37	3 0
Ambala	3 4	3 4	63	387	0	13	475	1 3	49	596	1 2	67	799	3 0	86	937	5 7	88	·941	5 5	82	80	2 7	70	510	0 5	75	355	1 1	82	277	2 4
Ludhiana	308	4 5	63	371	3 8	45	431	2 7	40	515	1 9	56	7 6	3 3	6	893	6 4	79	[illegible]	6 3	75	754	3 1	61	458	1 0	64	310	2 1	76	[illegible]	3 8
Lahore	95	3 6	65	374	3 4	47	419	2 3	41	501	1 8	52	603	[illegible]	71	877	4 3	75	890	3 8	67	734	1 4	57	433	0 5	67	313	1 5	78	52	2 9
Sialkot	307	3 2	67	383	2 8	43	436	2 1	41	519	1 5	5	699	2 0	74	885	3 9	79	892	[illegible]	70	740	[illegible]	59	434	0 7	65	304	1 5	74	[illegible]	[illegible]
Rawalpindi	63	4 3	72	339	4 1	56	[illegible]	3 1	44	472	2 1	50	6 0	2 8	72	808	4 2	80	839	4 2	72	685	1 9	[illegible]	391	1 0	65	258	[illegible]	74	10	3 6
Khushab	232	3 3	58	337	2 8	42	40	2 8	32	442	1 1	43	594	1 8	65	847	2 7	69	859	2 8	60	679	1 1	45	351	0 3	48	[illegible]	1 3	60	193	2 7
Montgomery	275	3 7	52	327	2 4	38	413	2 2	36	[illegible]	1 2	43	667	1 5	60	838	[illegible]	63	831	2 6	59	702	1 2	46	405	0·6	53	286	1 8	65	[illegible]	2 7
Multan	304	3 8	59	360	1 8	48	4 1	1 6	44	576	0 6	48	[illegible]	0 7	62	850	2 1	68	868	2 1	65	749	0 6	56	462	0 4	62	3 4	1 2	0	·261	[illegible]

Average winds recorded at ten Meteorological stations in the Punjab.

Station.	Elevation above sea level, in feet	January. Mean velocity, miles per hour.	January. General direction. Deg.	February. Mean velocity, miles per hour.	February. General direction. Deg.	March. Mean velocity, miles per hour.	March. General direction. Deg.	April. Mean velocity, miles per hour.	April. General direction. Deg.	May. Mean velocity, miles per hour.	May. General direction. Deg.	June. Mean velocity, miles per hour.	June. General direction. Deg.	July. Mean velocity, miles per hour.	July. General direction. Deg.	August. Mean velocity, miles per hour.	August. General direction. Deg.	September. Mean velocity, miles per hour.	September. General direction. Deg.	October. Mean velocity, miles per hour.	October. General direction. Deg.	November. Mean velocity, miles per hour.	November. General direction. Deg.	December. Mean velocity, miles per hour.	December. General direction. Deg.	Remarks.
Delhi	718	2·0	S. 87 W.	3·5	N. 86 W.	3·9	N. 87 W.	3·0	N. 77 W.	4·4	S. 73 W.	4·9	S. 44 E.	4·2	S. 22 E.	3·9	S. 27 W.	3·5	S. 85 W.	2·3	N. 83 W.	2·1	N. 89 W.	2·5	N. 87 W.	These places are subject to destructive winds attaining velocities as high as 60 miles or more per hour during dust-storms in the hot season. During the monsoon, and the cold season, winds are only light to moderate. The cold weather storms usually give high winds only in the hills to the north.
Sirsa	662	3·4	N. 36 W.	4·1	S. 76 W.	4·7	N. 24 W.	5·4	N. 28 W.	6·2	S. 39 W.	7·1	S. 27 W.	7·1	S. 16 W.	6·3	S. 42 W.	4·9	S. 59 W.	3·4	S. 31 W.	2·7	S. 18 W.	2·8	N. 84 W.	
Ambala	892	1·9	N. 48 W.	2·3	N. 30 W.	3·2	N. 37 W.	3·1	N. 18 W.	3·1	S. 89 E.	2·5	S. 61 E.	1·5	S. 62 E.	1·3	S. 51 E.	1·5	S. 39 W.	1·1	N. 10 W.	1·4	N. 34 W.	1·5	N. 44 W.	
Ludhiana	812	1·7	N. 59 W.	1·9	N. 52 W.	2·2	N. 31 W.	2·4	N. 27 E.	2·6	S. 44 E.	2·8	S. 37 E.	2·4	S. 34 E.	1·8	S. 29 E.	1·4	S. 20 E.	1·1	S. 55 E.	1·0	S. 27 W.	1·3	N. 47 W.	
Lahore	702	1·7	N. 88 W.	2·2	N. 23 W.	2·9	N. 10 W.	3·2	N. 31 E.	3·2	N. 72 E.	3·6	S. 60 E.	3·4	S. 42 E.	2·8	S. 41 E.	2·1	S. 34 E.	1·6	S. 83 E.	1·3	N. 5 W.	1·3	N. 58 W.	
Sialkot	830	1·3	N. 49 E.	1·8	N. 18 E.	2·1	N. 7 E.	2·8	N. 20 E.	3·1	N. 41 E.	3·1	N. 81 E.	2·8	S. 85 E.	2·5	N. 83 E.	1·8	N. 73 E.	1·4	N. 54 E.	0·8	N. 42 E.	0·9	N. 63 E.	
Rawalpindi	1,074	2·0	N. 40 W.	2·3	N. 45 W.	2·9	N. 39 W.	3·1	N. 30 W.	3·0	N. 14 E.	2·8	N. 89 E.	2·5	S. 82 E.	1·7	S. 82 E.	1·5	N. 56 E.	1·4	N. 5 W.	1·2	N. 50 W.	1·3	N. 41 W.	
Khushab	612	2·0	N. 18 E.	3·3	N. 20 E.	5·1	N. 22 E.	6·7	N. 37 E.	7·0	N. 14 E.	7·1	N. 69 E.	7·5	N. 62 E.	6·1	N. 68 E.	5·4	N. 65 E.	3·9	N. 48 E.	2·7	N. 33 E.	2·1	N. 27 E.	
Montgomery	558	3·4	N. 18 E.	4·2	N. 18 E.	5·4	N. 53 E.	6·3	S. 83 E.	7·5	S. 48 E.	9·5	S. 3 W.	9·6	S. 15 E.	8·2	S. 12 E.	6·9	S. 4 W.	4·1	S. 41 E.	2·0	S. 72 E.	2·6	N. 68 E.	
Multan	420	1·3	N. 45 E.	1·8	N. 37 E.	1·9	N. 50 E.	2·2	N. 51 E.	2·6	S. 12 E.	3·3	S. 3 W.	3·1	S. 89 W.	2·9	S. 14 E.	2·6	S. 5 W.	1·5	S. 40 E.	1·2	N. 72 E.	1·1	N. 53 E.	

Average temperatures recorded at ten Meteorological stations in the Punjab.

Station.	Elevation above sea level, in feet.	January. Normal mean temperature. Deg.	January. Normal maximum. Deg.	January. Normal minimum. Deg.	February. Normal mean temperature. Deg.	February. Normal maximum. Deg.	February. Normal minimum. Deg.	March. Normal mean temperature. Deg.	March. Normal maximum. Deg.	March. Normal minimum. Deg.	April. Normal mean temperature. Deg.	April. Normal maximum. Deg.	April. Normal minimum. Deg.
Delhi	718	59·3	70·7	47·0	63·3	71·8	51·8	71·8	87·4	62·2	86·6	99·7	73·5
Sirsa	662	57·1	71·0	43·1	61·0	75·2	46·8	72·9	88·6	57·2	84·8	101·1	68·5
Ambala	892	55·6	67·8	43·3	59·7	71·5	47·8	70·5	83·9	57·1	82·0	97·7	66·2
Ludhiana	812	55·8	67·2	44·3	59·4	71·2	47·5	71·0	84·4	57·5	82·3	97·4	67·2
Lahore	702	54·9	69·0	40·7	58·4	72·7	44·1	69·7	85·1	54·2	81·3	98·2	64·3
Sialkot	830	54·5	66·2	42·8	57·9	69·6	46·1	68·7	81·7	55·6	80·8	95·2	66·3
Rawalpindi	1,074	50·5	63·1	37·9	53·1	64·8	41·4	63·6	76·5	50·7	71·2	88·4	59·9
Khushab	612	54·5	67·0	41·3	57·4	68·7	46·1	68·7	80·6	56·8	81·7	95·3	68·0
Montgomery	558	55·4	68·5	42·2	59·6	72·8	46·4	70·8	85·7	55·9	84·1	100·1	68·1
Multan	420	56·8	70·2	48·3	60·6	73·7	47·5	72·5	86·5	58·4	88·8	99·0	68·0

Station.	May. Normal mean temperature. Deg.	May. Normal maximum. Deg.	May. Normal minimum. Deg.	June. Normal mean temperature. Deg.	June. Normal maximum. Deg.	June. Normal minimum. Deg.	July. Normal mean temperature. Deg.	July. Normal maximum. Deg.	July. Normal minimum. Deg.	August. Normal mean temperature. Deg.	August. Normal maximum. Deg.	August. Normal minimum. Deg.
Delhi	92·6	104·7	80·2	93·3	103·2	83·3	87·4	94·0	80·7	85·6	91·8	79·3
Sirsa	92·3	107·2	77·4	91·0	106·7	83·1	91·2	100·5	81·8	89·3	98·4	80·2
Ambala	91·1	105·2	76·0	90·8	101·4	80·2	86·1	93·3	78·9	85·5	92·8	76·1
Ludhiana	89·0	104·4	75·4	92·8	104·8	80·7	88·7	97·0	80·3	87·0	95·0	79·0
Lahore	89·2	105·7	72·6	93·4	107·4	79·3	90·0	100·6	79·4	85·0	94·2	77·8
Sialkot	89·0	103·1	71·8	93·0	105·5	80·5	88·6	97·6	79·5	86·2	91·7	77·7
Rawalpindi	83·4	98·1	68·6	89·1	102·8	75·3	87·0	97·3	76·7	81·6	93·9	75·2
Khushab	91·1	101·9	77·3	94·8	107·1	82·4	92·4	102·6	82·1	90·5	100·2	80·9
Montgomery	93·1	109·3	78·4	97·1	110·0	84·1	94·3	104·7	83·9	91·8	102·0	81·0
Multan	92·1	106·0	77·6	95·8	107·8	83·7	93·8	103·8	83·7	[illegible]	100·7	82·1

Station.	September. Normal mean temperature. Deg.	September. Normal maximum. Deg.	September. Normal minimum. Deg.	October. Normal mean temperature. Deg.	October. Normal maximum. Deg.	October. Normal minimum. Deg.	November. Normal mean temperature. Deg.	November. Normal maximum. Deg.	November. Normal minimum. Deg.	December. Normal mean temperature. Deg.	December. Normal maximum. Deg.	December. Normal minimum. Deg.
Delhi	85·0	93·0	77·0	80·0	92·1	67·9	69·6	82·9	56·2	61·3	73·7	48·9
Sirsa	87·3	98·9	75·7	79·4	96·1	62·0	67·2	81·9	49·5	58·8	74·9	42·7
Ambala	83·8	93·7	73·9	77·0	93·2	60·8	66·6	82·3	50·9	57·8	72·1	43·5
Ludhiana	84·0	94·9	71·8	77·5	91·9	63·0	65·8	80·6	50·9	57·5	71·0	44·0
Lahore	85·8	98·9	72·0	77·1	93·1	59·1	65·2	83·6	46·8	56·8	73·2	40·3
Sialkot	84·8	95·7	73·8	77·1	92·3	61·9	65·4	80·9	49·9	56·3	70·1	42·5
Rawalpindi	81·3	93·6	68·9	72·0	88·2	55·8	60·3	77·2	43·3	52·4	67·6	37·1
Khushab	87·7	99·6	73·8	77·9	93·8	61·9	66·3	82·8	49·7	56·8	71·7	41·9
Montgomery	88·9	101·7	76·1	79·4	96·6	62·2	67·6	84·2	50·9	58·0	72·9	43·0
Multan	89·0	100·4	77·8	80·0	95·5	64·4	68·4	84·4	52·4	59·2	73·9	41·4

Mr. D Milne called and examined

1107 (*President*) In my written evidence (see paragraphs 1071, 1072, and 1094), I have very briefly remarked on the influence of soil and climate on exotic cottons which have longer lint than our *deshis*, and the limitations imposed in consequence on their successful cultivation in the Punjab Since writing my evidence for the Cotton Committee, I have come across some notes in books dealings with American cotton growing which I think bear out my own experience with regard to the influence of soil and water supply on cotton lints, *viz* —

Antonia, Texas, 7 0 inches and for Georgia, Atlanta, 8 8 inches In Multan we only get

The atmosphere

Dissection of leaves is commonly associated with drought resist

onditions while others appear to make

when I first saw them in 1907, many

er condition *That was also the case*

which I have imported from America

since 1907. Natural crossing here appears to keep adding to the number of unsuitable as well as suitable sorts

1109 My ten years' experience has shown me that the Punjab climate is not a bar to the growing of good

getting eight, ten or twelve maunds of *kapas* per acre or even more from these American

1110 Our temperatures in the Punjab are much higher than I should like to see them Compare the

on the lighter soils, they will almost certainly get a short, irregular staple which, if mixed with well grown lint, will bring down the quality of the whole. A more even length of staple of American cotton would be got if these lighter soils grew *deshi* cotton. I think it would be well be mark out the lighter soils as not suitable for the cultivation of American cottons. The unsuitability of these soils seems to be due to their poor water-holding capacity. In colder climates there is less difficulty in increasing the water-holding capacity of soils than there is *here*, as there plant *débris* takes a long time to decay and consequently a good deal of humus, which aids the soil greatly to hold water, can be maintained in a soil. Here in the Punjab plains, on the other hand, decay of vegetable matter takes place so very rapidly that we see practically no humus in our soils. Even when a thick crop of *san* (*crotolaria juncia*) six feet high is ploughed down very roughly and the land is irrigated, the crop will entirely disappear in about a month owing to the combined action of fermentation and white ants. It would not disappear in six months in Britain. I think that cultivators should be warned that American cottons produced on light sandy excessively drained soils will almost certainly be inferior. One cannot legally stop a *zamindar* from growing American cotton on inferior soil, if he wishes to do so and he is not likely to listen to advice on the point unless it is decidedly to his profit. A poor price for the *kapas* would be a deterrent. Therefore there must be some arrangement made for a strict grading of cotton. The mixture of *kapas* from these sandy lands with well-grown *kapas* will certainly lower the standard of the whole crop.

1112. Cultivation is a very important factor in the conservation of soil moisture. To get an even lint a sufficient supply of water must be constantly available to the roots of the plant. A farmer may have good enough soil but if he does not conserve the soil moisture by interculturing with hoe or other implement he cannot expect to get good results in our climate. For the production of a good even lint, it is also most important that farmers on canal irrigated lands get their irrigation water regularly in proper time. A crop of uneven lint may be got from a number of causes besides from sowing seeds from a mixture of cotton types. The supply of cotton in the Punjab could be increased to a tremendous extent merely by improving the methods of cultivation.

1113. Cotton is a very tricky crop to grow. In my own experimental lands and elsewhere, I find that when the size of the plots are the same and the quality of the soil is as equal as possible, if the waterings and details of cultivation have not been done correctly and at the proper moment in each case, the difference in outturns got are sufficiently great to obscure inherent differences in cropping powers in different varieties. This year, although one plot of my selection No. 286 has given eleven maunds of *kapas* per acre, another plot of the same variety growing in the same square of land is giving only half that amount or less. In the latter case, there was not sufficient moisture in the soil when the crop was sown and consequently the germination was bad. The plot giving eleven maunds per acre was sown two or three days earlier than the other and germinated well. The two or three days delay in sowing made all the difference.

1114. I am at present doing a botanical survey of the cottons growing in the different districts. This year I am doing Multan.

1115. The cotton belt of the United States of America lies between 28° and 37° north latitude. The West Indian Islands lie about 18° north latitude. An interesting point about cotton in the American Cotton belt is that the spread of the cotton further west is limited by the slightness of the rainfall (*vide* " Southern Field Crops " by Duggar, page 384).

1116. Regarding the question of directly importing seeds from America, American cottons have never done well when first imported in from America to the Punjab. The climate in the American cotton belt being so different from that of the Punjab the plants have to adapt themselves very greatly in order to do well in the conditions here.

1117. In my cotton work my object is to produce a cotton that will yield to farmers a larger profit per acre than they get from the cottons which they are already growing. Therefore high ginning percentage, length, strength, etc., of lint, cropping powers, disease resistance and all other factors which affect profit per acre must be taken into account. We take into consideration the value of the seed. The value of the seed is very much less than that of lint, often about one-eighth of its value.

1118. I think the entomological section of the Agricultural Department in this Province ought to be strengthened and that the man in charge of it should pay special attention to cottons.

1119. The damage done to the cotton crop of the Province by root-rot is not negligible but is not of vital importance.

1120. As regards the organization of the Agricultural Department and the position of the Economic Botanist, I have put forward one or two alternative proposals in my written evidence. I would like to see a special botanist put on to cottons. It is a very important crop and my own experience of it is such that I feel I could spend the whole of my life and utilize to advantage every minute that I could give to the subject. In my opinion there should be one botanist for each important crop in the Province. I would suggest that it would be best to have a bureau of plant industry, so that a man would be allowed to make all necessary tests on any variety he evolves and could push his improved varieties right through to the hands of the *zamindars* with all speed. At the very least, the botanist should have a 300 acre farm to carry out his tests on. After the completion of the tests he could hand over the seed to the general agricultural officer to multiply and distribute it. The Economic Botanist would naturally always interest himself in his varieties but I would make the responsibility rest with the general agricultural officers after the varieties have been completely tested by the botanist. I think the botanist should be allowed to try his cottons outside his farm on *zamindars'* plots. It could easily be arranged that if the *zamindar* lost anything by growing a plot for the botanist, the difference could be made up from the money set aside under the heading " experiments " in the botanist's budget. In the case of the other aternative, *i.e.*, the bureau of plant industry, you would have one man to push the work of improvement of a crop from start to the *zamindar's* hands and you would have the force of self-interest driving on the work. Self-interest is the biggest driving force in the world. As to staff, I have one man on cotton work. Even with the present organization of the Agricultural Department, I would very much like to have a man of the grade of an Assistant Professor of Botany, if you cannot get a man from home who would specialize on cottons.

1121. From my experiences I would certainly advocate crop specialists in each province for the important crops. The Imperial Cotton Specialist has too wide a field for one officer to cover satisfactorily. India is very large. The conditions under which a crop is grown in one part of India may differ widely from those in others. The cottons suitable for one province may not be suitable for another Only the other day I had a letter stating that in Bihar, where the annual rainfall is several times what we have here, my 4-F. cotton

1122 (*Mr Wadia*) As regards the improvement of *deshi* cotton, the same general plan has been

that purpose

1124. The soil of the Hansi Farm is very irregular in quality On one occasion when I was there, I saw certain plots of cotton which differed very greatly in yield and had different varieties been growing in the

well.

1130 My object in proposing a central testing house and the issuing of certificates is to help spinners to give the highest possible price for cottons with safety to themselves.

1132. We have tried Cambodia here but it was not successful. It was far too late for us. It gave such poor yields that it could not compete with any of our varieties. It was tried again at Gurdaspur and we got the same result. It has been used to a different growing season from that of the Punjab.

1133. As regards moisture in cotton lint, the fibre is very hygroscopic, *i.e.*, it has the power to absorb moisture very readily. For example two ten gramme samples, one of 280-F. (American) and the other of 34 *indicum deshi* which I took from my ordinary stores of cotton and hung in a box containing an atmosphere saturated with moisture but not depositing dew, absorbed moisture to over six per cent. of their weight within five hours. I repeated the experiment and found that at the end of $1\frac{3}{4}$ hours two similar samples of the same cottons both absorbed moisture up to three per cent. of their weight.

Here are the amount of moisture contained in the samples before the experiments started, *viz.*:—

Percentage of loss by dryage at 105°C. of 280-F., 6·784.

Percentage of loss by dryage at 105° C. of 34 *indicum*, 6·444.

Samples of some other cotton lints taken from my store at the same time gave the following losses by dryage:—

Narma (American)	4·892 per cent.
46 *Sanguineum*(*deshi*)	4·708 ,,
22 *Mollisoni* (*deshi*)	4·782 ,,
34 *Roseum* (*deshi*)	4·646 ,,

The dryage figures were kindly got for me by Mr. Wilsdon. In the case of the ten gramme samples hung in the box all the fibres were more or less freely exposed to the saturated atmosphere. There is no doubt that, when such cotton lint is freely exposed to such an atmosphere, it can absorb at least that amount of moisture in the time. It is evident that a man might have his cotton quite honestly lying in a verandah on a damp day and that the moisture in it would increase greatly. The amount of increase would depend on the degree of saturation of the atmosphere and the amount of fibre exposed to it. One would get different results with small, or large heaps; with cartloads, or a bale. I am conducting experiments to get figures in such cases. Again if a *zamindar* picks his cotton in the morning and allows it to remain till evening dew sets in, he might get a good deal of moisture into his cotton without any criminal intention at all. What I want to emphasize is that cotton fibre is very hygroscopic and that, without any actual criminal mixture of water, the water contents might be altered very much.

1134. It is possible to improve the yield of cotton per acre in India very much indeed by improving the cultivation. Better irrigation and cultivation should double yields in many cases. I consider that this is the greatest avenue to improvement.

1135. The mean normal temperatures of the Egypt in the cotton season are nearer those of the American cotton states than those of India. There is a great difference in the temperatures of the Egyptian delta and those higher up the river. It must be remembered that the diurnal range of temperature in the Punjab plains is very wide. I am giving Egyptian cotton another trial but I am not very hopeful about it. It was an absolutely miserable failure here in previous trials. It was always very badly affected by fungi.

1136. Cotton seeds are pushed further apart on the opening of bolls of varieties with a high *kan* and short strong fibre than in the case of varieties with longer lint and a lower *kan*, therefore the *kapas* of the high *kanned* short linted varieties can be picked more rapidly and clearly. It is due to this that some villages near Multan are growing cotton with a high *kan*. In different parts of the province, I have come across plots of cotton containing a very high percentage of white-flowered varieties such as *mollisoni* and *roseum*. In these cases we usually found such that a house-wife had gone through the fields before the regular pickers to collect some clean cotton for home use and naturally collected *kapas* from the most showy bolls. The white-flowered varieties have the higher *kan* and hence the higher percentage of these in the fields sown with seeds from such *kapas*. In some cases the house-wife had selected the biggest fingers of *kapas* from a heap or store after the cotton had been picked from the plants so the colour of the flower was not used as a guide in the choice of the *kapas*. The longer more silky fibre of American cotton never hangs so well out of the boll as that from *deshi* cotton does and therefore it is more difficult to pick. The people object a little to American for this reason.

1137. (*Mr. Henderson.*) I think 4-F. good enough for our purpose to start with. Practically all the 4-F. seeds were black and almost naked when I handed them over to the Professor of Agriculture. *Narma* and the American cottons earliest brought into the Punjab have seeds more naked than the later introduced ones. The later introduced ones have a whitish fuzz. I have had cases in which I got both kinds of seed from one cotton plant. Although we get plants which look alike and give the same ginning percentage, the colour of the fuzzy seed has never been very stable. Whether a seed is fuzzy or not is not of much importance.

1138. As regards methods of improvement of cottons, my experience is that the best way to start off is by selection. One may improve them still further by crossing. No technical skill is required to perform the actual act of crossing but when the progeny from the cross is obtained, we are again reduced to selection and comparison with all their difficulties. The success of selection work will depend on the establishment and organization you have. If there is a botanist available he could do something both by selection and crossing. It is quite possible for a Deputy Director—or anyone else—to go far on the right tract. It all depends on how much study a man gives the subject. If there is no botanist in a province and cotton improvement work is important, whatever staff is available should be used in the work in the best possible way. All my *deshi* cottons that have been handed over are selections. There are considerable differences between my selections from the *neglectums*. Some botanists are coming round to the opinion that hybridization has not yielded good results as rapidly as at one time it was thought it would.

1139. In my written evidence, I have explained the method of crop improvement that I have followed here. It has been to find out first of all which are our best strains from the economic point of view and what their special characters are. Where it seemed to me necessary. I have crossed some of these but I did not consider it advisable to fill up my experimental lands and time with crosses before I had isolated by selection the best of the strains and had studied these. I consider that it was better to start with selection than hybridization in the Punjab. I should prefer not to criticise the work of other botanists. I should have acted in the same way wherever I had been stationed.

1140. As to the reason why white-flowered varieties of *deshi* cottons are in the minority in the mixture commonly grown in the Punjab, I have not obtained any satisfactory answer. I am working on lines which I think will bring me an answer.

1141 Regarding the climatic conditions under which cotton is grown in the Soudan, I have collected some data but have not yet in order to compare with our conditions here but have not yet worked out the case

1142 I must again point out that the high temperatures here make it very difficult to maintain humus in the soil owing to the rapidity of its decay A sandy soil with plenty of humus would be as favourable to cotton as any other

1143 4 F is a selection from *narma* and not from Dharwar American cotton

ANNEXURE

Comparison of temperature rainfall and humidity at certain stations in Egypt the United States and the Punjab

Station	Elevation in feet	1st April to end of August	1st September to end of November
NORMAL MEAN TEMPERATURE IN DEGREES FAHRENHEIT			
Egypt			
Abbassia (Cairo)	98 07	69 4°—83 3°	65°—77 9°
Helwan	379 16	68 ?°—81 7°	64 8 — 9 2°
Assuan	3?6·68	81 5°—9? 4°	73 6°— 89°
United States of America Cotton belt			
Mississippi (Vicksburg)	??6	66° 86°	56°—?6°
Texas (San Antonia)	660	69° 83°	63°—79°
Georgia (Atlanta)	10 ?	61°—78°	??°—72°
Punjab			
Multan	4?0	83° 9?°	80°—91 4°
Montgomery	558	84° 97 1°	67 6°—88 9°
Khushab	61?	81 7°—94 8°	66 3°—87 ?°
NORMAL MEAN HUMIDITY			
Egypt			
Abbassia (Cairo)	98 07	50—??	61—68
Helwan	379 16	43—54	58—6?
Assuan	3?6 68	?9—34	35—48
United States of America Cotton belt			
Mississippi (Vicksburg)	2 6	9—87	80—84
Texas (San Antonia)	660	80—8?	?8—83
Georgia (Atlanta)	10?	4—8?	6?—86
Punjab			
Multan	4?0	44—68	56- 65
Montgomery	558	36—63	46—69
Khushab	612	32—69	45—60

Comparison of temperature rainfall and humidity at certain stations in Egypt, the United States and the Punjab—contd.

Station.	Elevation in feet.	1st April to end of August.	1st September to end of 30th November.
AVERAGE NORMAL RAINFALL.			
Egypt.			
Abbasia (Cairo)	98·07	0·12"	0·2"
Helwan	370·16	0·12"	0 08"
Assuan	326 68	*Nil.*	*Nil.*
United States of America Cotton belt.			
Mississippi (Vicksburg)	226	21·7	10·3
Texas (San Antonia)	660	14·3	7·0
Georgia (Atlanta)	1052	20·3	8·8
Punjab.			
Multan	420	5·45	0·42
Montgomery	558	7·01	0 96
Khushab	612	10·37	0·85

Rai Sahib SEWAK RAM of Gangapur, Lyallpur District.

EXAMINED AT LYALLPUR, JANUARY 15TH, 1918.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

(a) "*Deshi*" *short staple cotton.*

1144. **(1) Experience.**—My experience of cotton growing extends to eighteen years in the Lyallpur District.

1145. **(2) Varieties.**—Hansi and Malerkotla are the varieties grown.

1146. **(3) Size of holdings.**—The average size of holdings is about thirteen acres in Lyallpur and the average proportion of cotton is one-fifth of the holding.

1147 **(4) Yields and profits.**—The average yield comes to about six maunds per acre in ordinary years but as the prices have been fluctuating since many years, no definite idea of profit can be given.

1148. **(5) Rotations and manures.**—The cotton is sown in *toria*, millet and maize fields. The application of manures is not general, but in rare cases farmyard manure is applied.

1149. **(7) Conditions affecting increase in area.**—The area used to fluctuate in the past years but the area under *deshi* is now decreasing every year, the reasons being that a better price is secured for 4-F. There is no possibility of increase under *deshi*.

1150. **(8) Uses of seed and seed selection.**—Seed is used for sowing and feeding cattle. I do not think it is exported. *Zamindars* do select seed by picking the best bolls and also by collecting good cotton from the heap with a view to improve their crop. This seed is hand ginned specially.

1151. **(9) General economic conditions.**—Research in connection with improvement of the plant must be carried on by experimental farms. It is very necessary to establish Government seed farms under Government control for production of improved seeds and also to get the assistance of big *zamindars*. By buying agency, I understand the middleman; he makes a great mixture of different varieties of cotton. Even after he buys it pure, he makes a great mixture of clean variety with the unclean poor variety, which he has bought very cheap. It would not be an easy thing to eliminate the middleman. Some co-operative society of cotton ginners and exporters should be formed, who would buy pure varieties from the *zamindars*. Such associations should form rules and regulations with regard to purity. Whoever breaks the rules and sends impure and bad variety in the market, must pay a penalty or be turned out of the society. Such associations should have a brand and trade mark which will show that best cotton is being supplied. If any buyer then buys cotton without the association's brand he knows what he is buying.

(b) "*Deshi*" *long-staple cotton.*

1152. **(11) Varieties.**—No long staple *deshi* cotton is grown by me.

1153. **(16) Suitability of existing varieties.**—Right varieties are not pushed at all. There is now no necessity of pushing these varieties as American cotton is taken up.

1154. **(17) Prevention of mixing of different varieties.**—To prevent mixture in the field, the owner of one holding should only sow one variety and no other. To prevent mixture in the factory, each factory owner should sort the carts as he buys them. It is difficult to prevent mixture by the middle man, as he always does it for his profit.

(c) *Exotic cotton*

1155 (21) **Varieties**—3 F and 4 F cotton are growing but now 3 F is being eradicated and pure 4 F is being grown

1156 (23) **Comparative returns**—I have only experience of 4 F cotton; the average yield of this cotton is six maunds per acre Its comparison with *desi* short staple is that, though the average outturn is equal, the price of exotic 4 F is 25 per cent more

1157 (25) **Conditions affecting increase in area.**—To increase the area, as the present length of growing is very short and the crop is injured by frost, some successful variety should be found so as to finish the picking by the middle of December Irrigation available is not sufficient. Early frost affects late sown exotic cottons. Increase of area under cotton would reduce the area under food crops, but we can easily increase it if supply of water is increased.

1158 (26) **Suitability of existing varieties**—So far as my experience goes, 4 F is the right variety [illegible]

V—General.

1160 (46) **Attitude of buyers to improved cottons**—Buyers do not give more price for improved cottons Government auctions have done a very useful work in raising the price Now that the Agricultural Department have taken in hand the work of posting prices at different markets it will serve a very useful purpose in getting *zamindars* good prices

1161 (48) **Desirability of alteration in water rates**—Water rate should be charged by some measurement system by volume and not per acre By this system the *zamindars* will make the best use of water by sowing the best crop

1162 (49) **Effect of tenure of land.**—Present tenure system does not much affect the cotton sowing

VI—Irrigation

1163 **Suggested modifications in canal system**—I am a canal irrigator since eighteen years. The system of canal irrigation requires a good deal of modifications I may be allowed to suggest a few—

[illegible]

1164 (51) **Wheat** *versus* **cotton**—At present, cotton is cultivated in less area than wheat but if [illegible] water supply [illegible] ...ning of April [illegible] area of cotton, [illegible] first watering [illegible]

Rai Sahib Sewak Ram called and examined.

1167 (*President*) The only cotton that I am growing is 4 F I am keeping it absolutely pure I think that the staff of the Agricultural Department, both European and Indian should be increased considerably [illegible] ...of cotton ginners and exporters should be formed [illegible]

[illegible] Bombay and Liverpool markets The Agricultural Department quotes Broach but last year [illegible] At present Punjab American is not a recognised standard [illegible]

[illegible] ...e time of sowing cotton and dating [illegible] ...here would be a considerable increase [illegible] In fact we received a circular order last year saying that any water taken in *kharif* for ploughing purposes would not be charged for if [illegible] by crop. One watering was, however, actually charged for by the *patwari* My idea is that it should not be [illegible] ...ked up, it could be charged for but if it is [illegible]

[illegible] ...ne variety should be sown by the *zamindar* [illegible] ...ociation or the Deputy Commissioner should [illegible] secure that only one variety should be sown. There should be a standing order which should go to each *zamindar* through the District Agricultural Association or through the Deputy Commissioner directing him to sow only one variety I think the cultivator can be controlled to that extent There are lots of other things, *e.g.*, use of selected seed and improved ploughs, etc., which are controlled in a similar way We also [illegible] by the instructions which are sent to us by Government from time to time. The difficulty is that the village shopkeeper buys *kapas* from three or four villages and mixes the lot The solution for this, which I have suggested in my written evidence, is that the middleman should be eliminated altogether and there should [illegible]

Comparison of temperature rainfall and humidity at certain stations in Egypt, the United States and the Punjab—contd.

Station.	Elevation in feet.	1st April to end of August.	1st September to end of 30th November.
AVERAGE NORMAL RAINFALL.			
Egypt.			
Abbasia (Cairo)	98·07	0·12"	0·2"
Helwan	379·16	0·12"	0 08"
Assuan	326·68	*Nil.*	*Nil.*
United States of America Cotton belt.			
Mississippi (Vicksburg)	226	21·7	10·3
Texas (San Antonia)	660	14·3	7·0
Georgia (Atlanta)	1052	20·3	8·8
Punjab.			
Multan	420	5·45	0·42
Montgomery	558	7·01	0·96
Khushab	612	10·37	0·85

Rai Sahib SEWAK RAM of Gangapur, Lyallpur District.

EXAMINED AT LYALLPUR, JANUARY 15TH, 1918.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

(a) "*Deshi*" *short staple cotton.*

1144. **(1) Experience.**—My experience of cotton growing extends to eighteen years in the Lyallpur District.

1145. **(2) Varieties.**—Hansi and Malerkotla are the varieties grown.

1146. **(3) Size of holdings.**—The average size of holdings is about thirteen acres in Lyallpur and the average proportion of cotton is one-fifth of the holding.

1147 **(4) Yields and profits.**—The average yield comes to about six maunds per acre in ordinary years but as the prices have been fluctuating since many years, no definite idea of profit can be given.

1148. **(5) Rotations and manures.**—The cotton is sown in *toria*, millet and maize fields. The application of manures is not general, but in rare cases farmyard manure is applied.

1149. **(7) Conditions affecting increase in area.**—The area used to fluctuate in the past years but the area under *deshi* is now decreasing every year, the reasons being that a better price is secured for 4-F. There is no possibility of increase under *deshi*.

1150. **(8) Uses of seed and seed selection.**—Seed is used for sowing and feeding cattle. I do not think it is exported. *Zamindars* do select seed by picking the best bolls and also by collecting good cotton from the heap with a view to improve their crop. This seed is hand ginned specially.

1151. **(9) General economic conditions.**—Research in connection with improvement of the plant must be carried on by experimental farms. It is very necessary to establish Government seed farms under Government control for production of improved seeds and also to get the assistance of big *zamindars*. By buying agency, I understand the middleman; he makes a great mixture of different varieties of cotton. Even after he buys it pure, he makes a great mixture of clean variety with the unclean poor variety, which he has bought very cheap. It would not be an easy thing to eliminate the middleman. Some co-operative society of cotton ginners and exporters should be formed, who would buy pure varieties from the *zamindars*. Such associations should form rules and regulations with regard to purity. Whoever breaks the rules and sends impure and bad variety in the market, must pay a penalty or be turned out of the society. Such associations should have a brand and trade mark which will show that best cotton is being supplied. If any buyer then buys cotton without the association's brand he knows what he is buying.

(b) "*Deshi*" *long-staple cotton.*

1152. **(11) Varieties.**—No long staple *deshi* cotton is grown by me.

1153. **(16) Suitability of existing varieties.**—Right varieties are not pushed at all. There is now no necessity of pushing these varieties as American cotton is taken up.

1154. **(17) Prevention of mixing of different varieties.**—To prevent mixture in the field, the owner of one holding should only sow one variety and no other. To prevent mixture in the factory, each factory owner should sort the carts as he buys them. It is difficult to prevent mixture by the middle man, as he always does it for his profit.

(c) *Exotic cotton*

1155 (21) **Varieties** —*3 F and 4 F cotton are growing but now 3 F is being eradicated and pure 4 F* is being grown

1156 (23) **Comparative returns** —I have only experience of 4 F cotton, the average yield of this

exotic cotton. Increase of area under cotton would reduce the area under food crops but we can easily

V —GENERAL.

1160 (46) **Attitude of buyers to improved cottons** —Buyers do not give more price for im

surement system by volume and not per acre *By this system the zamindars* will make the best use of water by sowing the best crop

1162 (49) **Effect of tenure of land** —Present tenure system does not much affect the cotton sowing

VI —IRRIGATION

1163 **Suggested modifications in canal system** —I am a canal irrigator since eighteen years The system of canal irrigation requires a good deal of modifications I may be allowed to suggest a few—

Revenue authorities

and also the beginning of October are the critical periods

the cultivation of it would become risky, if water in the canals is not increased

1166 (52) (b) **Watering of cotton** —Cotton sown by the beginning of April requires first watering sometimes in June The volume of each watering is about six inches

Rai Sahib SEWAK RAM called and examined

I think

Comparison of temperature rainfall and humidity at certain stations in Egypt, the United States and the Punjab—contd.

Station.	Elevation in feet.	1st April to end of August.	1st September to end of 30th November.
AVERAGE NORMAL RAINFALL.			
Egypt.			
Abbasia (Cairo)	98·07	0·12"	0·2"
Helwan	379·10	0·12"	0·08"
Assuan	326·68	*Nil.*	*Nil.*
United States of America Cotton belt.			
Mississippi (Vicksburg)	226	21·7	10·3
Texas (San Antonia)	660	14·3	7·0
Georgia (Atlanta)	1052	20·3	8·8
Punjab.			
Multan	420	5·45	0·42
Montgomery	558	7·01	0·96
Khushab	612	10·37	0·85

Rai Sahib SEWAK RAM of Gangapur, Lyallpur District.

EXAMINED AT LYALLPUR, JANUARY 15TH, 1918.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

(a) "*Deshi*" *short staple cotton.*

1144. (1) **Experience.**—My experience of cotton growing extends to eighteen years in the Lyallpur District.

1145. (2) **Varieties.**—Hansi and Malerkotla are the varieties grown.

1146. (3) **Size of holdings.**—The average size of holdings is about thirteen acres in Lyallpur and the average proportion of cotton is one-fifth of the holding.

1147 (4) **Yields and profits.**—The average yield comes to about six maunds per acre in ordinary years but as the prices have been fluctuating since many years, no definite idea of profit can be given.

1148. (5) **Rotations and manures.**—The cotton is sown in *toria*, millet and maize fields. The application of manures is not general, but in rare cases farmyard manure is applied.

1149. (7) **Conditions affecting increase in area.**—The area used to fluctuate in the past years but the area under *deshi* is now decreasing every year, the reasons being that a better price is secured for 4-F. There is no possibility of increase under *deshi*.

1150. (8) **Uses of seed and seed selection.**—Seed is used for sowing and feeding cattle. I do not think it is exported. *Zamindars* do select seed by picking the best bolls and also by collecting good cotton from the heap with a view to improve their crop. This seed is hand ginned specially.

1151. (9) **General economic conditions.**—Research in connection with improvement of the plant must be carried on by experimental farms. It is very necessary to establish Government seed farms under Government control for production of improved seeds and also to get the assistance of big *zamindars*. By buying agency, I understand the middleman; he makes a great mixture of different varieties of cotton. Even after he buys it pure, he makes a great mixture of clean variety with the unclean poor variety, which he has bought very cheap. It would not be an easy thing to eliminate the middleman. Some co-operative society of cotton ginners and exporters should be formed, who would buy pure varieties from the *zamindars*. Such associations should form rules and regulations with regard to purity. Whoever breaks the rules and sends impure and bad variety in the market, must pay a penalty or be turned out of the society. Such associations should have a brand and trade mark which will show that best cotton is being supplied. If any buyer then buys cotton without the association's brand he knows what he is buying.

(b) "*Deshi*" *long-staple cotton.*

1152. (11) **Varieties.**—No long staple *deshi* cotton is grown by me.

1153. (16) **Suitability of existing varieties.**—Right varieties are not pushed at all. There is now no necessity of pushing these varieties as American cotton is taken up.

1154. (17) **Prevention of mixing of different varieties.**—To prevent mixture in the field, the owner of one holding should only sow one variety and no other. To prevent mixture in the factory, each factory owner should sort the carts as he buys them. It is difficult to prevent mixture by the middle man, as he always does it for his profit.

(c) Exotic cotton.

1155 (21) **Varieties.**—3 F. and 4 F. cotton are growing but now 3 F is being eradicated and pure 4-F is being grown

1156 (23) **Comparative returns**—I have only experience of 4 F cotton; the average yield of this

V.—GENERAL.

1160. (46) **Attitude of buyers to improved cottons.**—Buyers do not give more price for im

surement system by volume and not per acre By this system the *zamindars* will make the best use of water by sowing the best crop.

1162 (49) ***Effect of tenure of land.***—*Present tenure system does not much affect the cotton* sowing

VI.—IRRIGATION

1163. **Suggested modifications in canal system**—I am a canal irrigator since eighteen years The system of canal irrigation requires a good deal of modifications I may be allowed to suggest a few—

Revenue authorities

and also the beginning of October are the critical periods If there is an increase in the area of cotton, the cultivation of it would become risky, if water in the canals is not increased

1166 (52) (h) **Watering of cotton.**—Cotton sown by the beginning of April requires first watering sometimes in June The volume of each watering is about six inches

Rai Sahib SEWAK RAM called and examined

man who mixes different varieties of cotton He spoils all the trouble that we take in producing a pure strain ... the villages I do not think the

... The Agricultural Department quotes ...

be a co-operative system of purchase. The *zamindars* should sell to the co-operative society and not to the middleman. To prevent mixture in the factory, each factory owner should sort out the carts when he buys them. Every cartman should be warned to make a separate heap of a particular variety when bringing it into a factory. There must be some hold on the ginners too. The ginners will not mix if they get a good price for pure varieties. Pools must be abolished entirely or left alone as you cannot prevent those factories which are not working from joining the pool. If you made pools illegal, you would prevent suits being brought in court. I am against pools altogether.

1171. (*Mr. Roberts.*) It is my idea that the co-operative association of sellers of cotton should not be run by Government but it should be run by a private agency. The Bombay people would only buy the stuff sent by the association. It would be necessary to have these associations recognised in Bombay.

1172. My experience of American cotton is that it is a perfectly safe crop. 4-F cotton has been selected after a series of experiments. I am intending to cultivate 25 per cent. of more cotton on present supplies as in the statement I put in.

1173. I am in favour of water being charged for by volume instead of as at present. In that case the *zamindar* would be able to get a higher duty from the same quantity of water.

Annexure I.

Existing and suggested cropping for an area of 100 acres.

	No. 1. Present common practice.	No. 2. What can be done with cotton at 25 per cent.	No. 3. What can be done with cotton at 30 per cent.
Wheat	40	40	40
Toria	12	12	10
Cotton	20	25	30
Kharif-fodder	8	8	8
Rabi-fodder	8	8	8
Sugarcane	4	3	*Nil*
Maize	8	4	4
Total	100	100	100

Senji, etc., can be grown without disturbing the above division in *kharif*-fodder area.

Existing and suggested rotations.

Rotation in the case of No. 1 is done by zamindars in different ways.

Suggested rotation in the case of No. 2.				Suggested rotation in the case of No. 3.			
1st year.		*2nd year.*		*1st year.*		*2nd year.*	
Wheat	40	*Toria*	12	Wheat	40	*Toria*	10
or Wheat	36	*Kharif*-fodder	8	or Wheat	36	*Kharif*-fodder	8
Gram	4			Gram	4		
		Rabi-fodder	8			*Rabi*-fodder	8
		Maize	4			Maize	4
		Cotton	1			Cotton	6
		Wheat or Gram	7			Gram	4
Toria	12	Cotton	12	*Toria*	10	Cotton	10
Cotton	25	Wheat	25	Cotton	30	Wheat	30
Kharif-fodder	8	Wheat	5	*Kharif*-fodder	8	Wheat	6
		Sugarcane	3			Cotton	2
Rabi-fodder	8	Cotton	8	*Rabi*-fodder	8	Cotton	8
Sugarcane	3	Wheat	3	Maize	4	Cotton	4
Maize	4	Cotton	4				

The Hon'ble Khan Bahadur MEHDI SHAH of Gojra, Lyallpur District

EXAMINED AT LYALLPUR JANUARY 17TH 1918

Written statement

I —AGRICULTURAL EXPERIENCE

(a) *Deshi* short staple cotton

1174 (1) **Experience** —I own 36 squares of land (one square is equal to 27 acres and seven *kanals*) in the Lyallpur District and have been living here since 1898 Cotton cultivation is carried on in my own estate

1175 (2) **Varieties** —This District has been growing mostly *Tillar* and *Multani* varieties of short staple cotton and it is only within recent years that American cotton has become so popular on an average about one sixth of the whole area is under cultivation here—an acre yielding generally 5½ maunds or so

1176 (5) **Rotations and manures** —Cotton is mostly followed by sugarcane or wheat and no manures are applied in the Chenab Colony

1177 (7) **Conditions affecting increase in area** —Only one main circumstance causes an appreciable decrease in the area under cotton and that is when an insect called ' boll worm ' assumes the form of an epidemic terrifying the cultivators With the daily growing popularity of the American cotton, there is no possibility of an increase in the area under *deshi* short staple cotton On the other hand *deshi* short staple cotton is fast disappearing

1178 (8) **Uses of seed and seed selection** —The seed was formerly used mainly as food for the cattle here but now it is exported outside [illegible] purposes is generally carefully selected [illegible] cotton buds are picked up by the culti[illegible] country hand ginned seed for sowing pur[illegible] process of ginning at a machine and therefore sometimes does not grow properly and is not used in the Chenab Colony

(b) "*Deshi*" long staple cotton

1179 (11) **Varieties** —*Deshi* long staple cotton is not cultivated in the Chenab Colony

(c) *Exotic Cotton*

1180 (23) **Comparative returns** —The case of exotic cotton is almost akin to that of *deshi* short staple [illegible]

ment

1182 (28) **Importation of seed** —It will certainly be desirable to import selected seed direct from [illegible]

II —COMMERCIAL ASPECT

1183 (30) **Local trade customs** —Cash payment is the only local trade custom which at present [illegible]

[illegible] o qualities of [illegible] ard names by [illegible] rations are at present needed to change these standard names

III —STATISTICAL

1185 (35) **Publication of Bombay and Liverpool prices** —The daily publication of cotton prices at [illegible] on the whole very useful But the cultivator [illegible]

auctions can easily be arranged by the committees where the markets are stituated, with profit both to the public and the committee.

VI.—IRRIGATION.

1186. (56) (a) **Utilization of wells for irrigation of cotton in canal areas.**—The Chenab Colony is irrigated by the canals and therefore no need arises in this part of the country to irrigate the cotton crop by means of wells. But as I have got land in the Bhawalpur State also where the irrigation is done by inundation canals which give water in summer months only, therefore cotton cannot be cultivated there unless sowing is first done by the water of the wells or by any agency other than those of the canals. The Bhawalpur soil is particularly suitable for the cultivation of the American cotton and therefore the combination of both well and canal system would be quite feasible there.

1187. (56) (e) **Tube wells.**—Tube wells can work quite satisfactorily at least in the south-western part of the Bhawalpur State, where the spring level is generally from nine to ten feet deep. I have tried the experiment in my own estate in Bhawalpur in Khanpur District, and the experiment has proved quite a success.

1188. (52) (b) **Watering of cotton.**—In the Chenab Colony, cotton crop needs six waterings in all. The first water is given in the month of March for the preparation of the soil. The second water is given at the end of April when the cotton plant has grown some nine inches in height. Third water is given in the middle of May. The fourth water is given in the beginning of June. The fifth water is given in July, and the sixth in August or September, according to the season of rain. As regards volume of water required per acre, an acre is equal to 40×38 *karams* and a *karam* is equal to 5½ feet. Therefore an acre is equal to 11,245 feet. The cotton soil requires water three inches deep. Therefore the volume of water required is one quarter of 11,245 feet.

1189. (60) **Practicability of lining canals.**—I cannot support the idea of the lining of the canals. I do admit that the water may increase a little both in summer and in winter by this process but this small increase in water is not justified by the expenditure incurred. Moreover if the canals are not lined, the water in its course takes mud from here and there and this when it goes into fields serves the purpose of a manure. Thus the productivity of the soil is not lessened in spite of the constant use of the soil. On the other hand, if the canals are lined, the water can carry no such mud with the result that the cultivator will be deprived of a most valuable natural manure, so useful for the crops. This phenomenon is exemplified in the case of the Upper Swat river canal which passes through the mountainous regions and carries no such mud. If it be argued that water logging will spoil the lands adjacent to the canal course, I would suggest that trenches eight feet deep may be dug every two miles apart towards the down stream direction and the water of these trenches may be diverted to another trench which may be excavated joining the ends of all these trenches. The water thus collected can with advantage be utilised in the irrigation of some other area while the land adjacent to the canal course will also dry up. This system is well illustrated in the case of the Hafizabad canal in the Gujranwala District of the Punjab.

The Hon'ble Khan Bahadur MEHDI SHAH called and examined.

1190. (*President.*) I am a fairly large *zamindar*. I cultivate some squares myself and some are cultivated by my tenants. I sow American cotton 4-F at Gojra. It is doing well and I am very pleased with it. I used to grow *deshi* cotton, but I have totally stopped doing so. American cotton is much safer than *deshi*. I have moderate irrigation facilities. I have introduced the cultivation of American cotton into the Bahawalpur State. I have five thousand acres there, which I am cultivating under well irrigation. I have got one tube well and one pump which is on the canal. The water is first supplied by the tube well and then from the pump on the canal. This is the second crop of American cotton that I am trying there.

1191. (*Mr. Roberts.*) The first year I started American cotton in Bahawalpur, I started very late. It was better in the second year; this year is the third year. I have three squares, *i.e.*, about 75 acres under American cotton. The crop is very good. We have had much rain this year; I do not remember ever seeing so much rain in the Bahawalpur State during the last eighteen years. Yet the American cotton has not suffered in any way and therefore I consider there are very good prospects for American cotton in Bahawalpur. It is the best part of India for American cotton. The soil is excellent. With perennial irrigation, it would be possible to extend the area very greatly. American cotton stands rain and boll worm better than any other cotton.

1192. My idea is that more sales should be organized. There should be three or four auctions every month. The difficulty is at present that there is no place for storing cotton in the *mandis* when the carts bring it in. I am President of the Municipal Committee and so I know about all these things. When the carts arrive there in the morning, they have to make the bargain then and there and take the cotton to the factories as there is no place for keeping it in the *mandis*. Cotton markets should be provided which should be managed by committees, associations or Government. I would not like them divided up into shops. There would be the same difficulty as now in the *mandis*. Take the case of wheat. Everybody in the *mandi* knows there is a difference of two to four annas because of competition. Wheat is brought and left there: the buyers come and see whether it is good or bad and we can get a good price for it. I would like the same arrangements made for cotton as for wheat. At present there is no place to keep cotton: some of the cotton lies on the spot where it has been sold. Dust and dirt get into it and as a result the colour is spoilt. I do not think there would be any difficulty in arranging a big cotton market. Everything will then be satisfactory and there will be no difficulty about sales. If no one wants to buy the cotton, it can be kept in the sheds for some time and sold afterwards.

1193. The publication of the price of cotton is a great benefit but the pool at Gojra reduced the price by Rs. 2. Three of the factories there are not working. This season more cotton has come in to Lyallpur because the people at Gojra knew about the pool and therefore the *zamindars* as far as eight or nine miles from Gojra brought in cotton to Lyallpur. They could carry about thirty maunds in one cart so that they got Rs. 60 more per cart for it. It only takes them 36 hours to bring the cotton in and go back to their homes. Railway carriage for thirty miles is difficult as it means making arrangements with the railways and loading and unloading the *kapas* so it was brought in to the *mandi* in Lyallpur in carts. Until there is legislation, the publication of prices will be of no effect on account of the pools. Last year, I arranged to break the pool at Gojra and I succeeded but this year I tried my best but I could not. One man stood out of the pool last year. He made arrangements to get his cotton pressed at Tandlianwalla. This year, I believe, that the Tandlianwalla people have refused to press for him. He has therefore no press this year though he

has a gin and has been obliged to go into the pool. Pools cannot be stopped except by legislat on Messrs Tatas wo t join the pool There s no other firm to compete with them I cannot say whether tl eir influence will break the pool

is
re
s

o
m
kı
ır
ur

1197 Tl e land there was granted to n e n 1898 an I I got propr etary r ghts subsequently The t me has go e for buying land cheaply in Baha alpur I sent a man from the Ra valpind D str ct to Bahawalpur He was n y servant I gave him a part of my tra t

1 700 b ghas I l ought the vhole area for under Ps

will be taken away

ble n regard to m xing They

per cent and the u u y

twenty per cent I do not know wl at s

do n wan t s m xt re why do they

the evil but there must be some expert to judge, as without expert opinion, legislation could not be worked. We cannot compete with other countries unless cotton is pure. What we want is some kind of arrangement under which the purity of the cotton would be maintained and our cotton would get its proper price. I cannot suggest licensing of ginneries by legislation, as I do not see how you could deal with those factories which are now in existence. If there is legislation for the licensing of ginneries, there should be a condition that those factories that will not work according to Government rules would be confiscated. If in a certain factory the cotton was mixed, then the factory-owner should not have a licence to work.

1203. Owing to the existence of pools, the cultivators cannot realize the full value of their *kapas* and are bound to take Re. 1 a maund less. Had the cultivators any checks or markets, they would be able to say that they will keep their cotton rather than submit to a lower rate. I have suggested cotton markets for a long time past. Without such markets you cannot do anything. Buyers will come from Bombay and Karachi and they will be able to keep their cotton in the sheds and that will give them facilities. The *zamindars* in this Colony are not in the habit of keeping any stock. As the produce comes in, they take it to the *mandis*.

1204. (*Mr. Hodgkinson.*) I am not satisfied with the weighing in the factories. I have actually not seen cases of false weighing but I have on several occasions heard complaints that the weights of such and such a man are unfair. I asked the complainants to lodge complaints in writing but they settled matters otherwise. We have not got standard weights. Even if you have standard weights here, the factories at a distance from the towns could arrange at any time for the *chaukidar* to give warning and for the false weights to be hidden and the standard weights produced. There should be legislation, and there should be some special arrangement by which the *zamindar* could get the proper weight. I am in favour of standard weights which should be stamped and the factory owners should not keep any weight but the standard weight. If any weights besides the standard weights were found, the owners possessing such weights should be penalised. There should be a law that there should be no weights in a factory except those which were marked by the Municipal Committee. That should be made a condition of the factory licence.

1205. (*Mr. Ashton.*) If the supply in the canal were very largely increased, there is, of course, the danger of sugarcane cultivation and rice cultivation being increased but that would depend on the respective profits from sugarcane and cotton. If the income from sugarcane is less than that of cotton, then the cultivators will take to cotton. Cotton is easier to grow than sugarcane.

Lala BHAWANI DASS, Municipal Commissioner and Member, District Board, Lyallpur.

EXAMINED AT LYALLPUR, JANUARY 15TH, 1918.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

(*a*) "*Deshi*" *short staple cotton.*

1206. **(1) Experience.**—I have been here in the Lyallpur District for twenty years. I possess some squares of land. Also I am holding very big tracts of land, on contract. I was also holding some land in Sind sometime back. I am specially interested in agriculture.

1207. **(2) Varieties.**—Before the introduction of American cotton, the following were the various varieties of short-staple cotton in this colony:—

(i) *Hassari* cotton, seed for which was obtained from the factories.
(ii) *Baroch* (a Sind variety). I tried it, but it did not prove profitable.
(iii) *Chandausi*.

1208. **(3) Size of holdings.**—On an average the land, over which cotton is grown, is four acres to a square or about sixteen per cent. of the land under cultivation.

1209. **(4) Yields and profits.**—The average yields per acre are six maunds. The profit, of course, varies with rates, which are not fixed. During the last many years, the rate has been varying from Rs. 6 a maund to Rs. 12 a maund.

1210. **(5) Manures.**—Generally no manure is used.

1211. **(7) Conditions affecting increase in area.**—In Lyallpur District, the fluctuations in the area under cotton are not very large. The fluctuation is due to the inconstancy in the rates of cotton. Supposing in a certain season the cotton rate becomes cheaper, the next season people neglect cotton and pay more attention to sugarcane, maize (*makki*) and other crops of comparatively high prices.

1212. **(8) Uses of seed and seed selection.**—Seed is generally used as a fodder for the animals. Formerly it was the general custom with experienced landlords to collect big tufts of cotton from the cotton products of the middle of the cotton season. The seed obtained therefrom was considered a good one. But, at present, seed is generally bought from ginning factories though some people also get it from the Agricultural Farm.

1213. **(9) General economic conditions.**—In my opinion, the climatic conditions of the colony have been rendered unfavourable for a good cultivation of *deshi* cotton. Those of the landlords here, who are still growing the variety of cotton are doing so only out of ignorance and prejudice to the introduction of American cotton. Some cultivators of small and uninfluential landlords are rather averse to the growing of American cotton simply because they assert that the hand woven cloth can be made better if *deshi* cotton be used. This assertion, to me at least, appears to be quite erroneous and unreasonable. For, from my own experience, I know thoroughly well that cloth prepared out of American cotton is soft and durable. It is possible that a greater labour is required in the cleaning and spinning of the American cotton.

(2) The season favourable for the sowing of *deshi* cotton is the month of May. This variety can grow easily in an area from which the wheat has been just cut, whereas American and Egyptian cotton cannot grow there. On such an area from which wheat has been cut, there are fewer weeds. In the end, I may say frankly and out of no flattery, that my experience has made me a bitter enemy to the *deshi* cotton, since many years. Its yield per acre is quite uncertain.

(b) "Deshi" long staple cotton

(c) Exotic cotton

ontrol is about six maunds

with sugarcane and maize

1221 (25) Conditions affecting increase in area.—The speed of the introduction of the American cotton is more than satisfactory Its rates of sale are about twenty per cent higher than that of the *deshi* variety In many places, people cultivate a mixture of American cotton and *deshi* cotton This is impeding the introduction of pure American variety To my knowledge, the ginning factories gin a mixture of the two varieties.

1222 (26) Suitabilities of existing varieties.—If pure American cotton be sent abroad from India,

insects.

1223 (29) General economic conditions.—A few years ago, I was holding land in Sind. There I

II.—Commercial Aspect

the towns for describe below

ave to agree to ishonest The mmission from

very rare.

V.—GENERAL.

1227. (48) **Desirability of alteration in water rates.**—*In my opinion and knowledge,* no change is required in the present system of water rate. The only point worth note is the following. If there be two crops growing in a certain area at the same time, then if one be cut and the other is left behind, then both the crops are charged water rates, although they were occupying the same area and although the remaining crop does not require any further water. For example, in the area of *chari* and gram grown together, the *chari* is cut first and water rate is charged for *chari*, then afterwards no water is required for gram, still the gram is charged extra water rate. The same is the case with the combined crops of *toria* and gram. It is desirable that, in such cases, the water rate may be charged only once.

VI.—IRRIGATION.

1228. (51) **Wheat** *versus* **cotton.**—During the last years, the people have been preferring wheat, but not much. The land allotted to wheat is about 48 per cent. of the total cultivated land.

1229. (52) (*a*) **Critical period in regard to water supply.**—The critical period is from the middle of August to the end of October.

1230. (52) (*b*) **Watering of cotton.**—*Cotton is watered at least five times a year after sowing. In my* opinion, if big tanks be dug by the cultivators themselves, and if water be stored there in time of necessity, that water may be used by means of *jhallars* (a Punjabee name) and cultivators should be granted concession in the charges for water rate, if they sow cotton over a greater area than at present cultivated. Allowances must be made for the fact that cultivators require bullocks for ploughing during cotton season and *rabi* crop and they shall also be required to draw water for the cotton crop.

1231. (54) **Improvement in duty of water by remodelling of outlets.**—The system of modules is very good, for water is equally distributed both near the head and near the tail of the canal.

1232. (56) (c) **Tube wells.**—In my opinion, if the Government adopt the following suggestion, a good portion of the land belonging to Government and suitable for cultivation may be brought under cultivation and landlords, whose lands are lying in a similar condition, would follow the example. First of all, a special enquiry be made as to what tracts of Government lands now lying uncultivated are suitable for agriculture. Then the Government should lease them out to certain people with further prospects of endowing the right of personal property, provided those people get the tube wells constructed in those areas at their own costs. The time has come that the old system of wells should give place to tube wells.

1233. (58) **Cropping and causes affecting it.**—Out of 100 acres of cultivated land—

16 acres are under cotton.
4 acres are under sugarcane.
8 acres are under fodder *kharif.*
6 acres are under *makki.*
16 acres are under *toria.*
48 acres are under wheat.

(2) There is little change in the above from year to year, due to the change in the rainy weather and fluctuation in rates.

1234. *Importance of cattle manure.*—The area under fodder has been reduced on account of the temptation offered by the high rates of certain crops. Consequently, an important thing has been overlooked by all the *zamindars* and authorities. The best manure is that of the animals' refuse. The number of the animals kept by a landlord depends upon the good quality of land and large quantity of water supplied. If his other crops are good, his fodder is also good. To increase the number of animals kept by *zamindars* is an important problem both for the Government and the people. The manure supplied would be of superior kind and the bullocks would become cheaper. By which both the parties, the Government and the people would profit in the long run. This can be effected, if out of each square of land, a fixed portion is set apart for fodder compulsorily. The water rate and revenue for that area under fodder be remitted whereon the loss may be made up, if necessary, by a little increase in the rates for the other crops. One who does not grow fodder on the fixed area may be charged four times the water rate and revenue for that area.

Lala BHAWANI DASS called and examined.

1235. (*President.*) I have worked for a long time in Sind. I consider that Sind cotton and Broach are in the same class. I have stated in my written evidence that better hand woven cloth can be made if *deshi* cotton be used. People ordinarily say that for hand spinning and hand weaving, *deshi* cotton is better than American cotton but, to my mind, the advantages of *deshi* are very much exaggerated. I keep about two maunds of *kapas* every year and have it hand spun and woven. I think the cloth woven from American cotton is softer, stronger and whiter than that from *deshi.*

1236. I have not seen the ginning factories mixing American and *deshi* cotton but everybody says they do it.

1237. I grew Egyptian cotton in Sind for several years. In some years, it was very good but in years when there was very heavy dew at the time when the seeds were ripening, the cotton was spoilt on account of the saltness in the dew owing to the proximity of the sea.

1238. I have always sold my cotton at the Government auctions since they have been started. In my opinion, had these sales not been started by Government, there would have been no pure American in this country. I always bring my cotton in pure. My cotton is classed by the Agricultural Department as A.1. It goes to Gojra, Jaranwala, Lyallpur and Sangla. Very occasionally there might be a little *deshi* cotton mixed in it owing to all the *deshi* plants not being rogued out but I do my best to keep it pure in the field. I sold some of my cotton at the auction sale last Sunday which the Committee attended. I got a good price for it. It was bought by Messrs. Forbes, Forbes Campbell and Company. Delivery was given at the auction and it was weighed there.

1239. In Lyallpur there has been a pool for some time. The charges are different at different places. The factories not working get a profit. There are about ten or fifteen factories in Lyallpur of which only four or five are working. The profit that goes to the factories that are not working comes out of the pocket

The Hon'ble Mr. C. A. H. TOWNSEND, I.C S , Director of Agriculture, Punjab

EXAMINED AT LYALLPUR, JANUARY 16TH 1918

Written statement

PART I —GENERAL SURVEY OF THE PROVINCE

1212 *Area under cotton in the Punjab*—In the Punjab (including Native States) as a whole the area under cotton in each of the last ten years shows but little tendency to rise Here are the figures under the crop in each year—

	Acres	
1908	15 52 339	
1909	14 16 698	(a)
1910	13 76 529	(b)
1911	15 87 676	
1912	15 76 029	
1913	20 70 050	(c)
1914	18 68 263	(d)
1915	9 02 204	(e)
1916	11 63 181	(f)
1917	17 39 623	(g)
Average	15 25 259	

The decreased area
turists were very busy

the conditions in April
in area The season
was a record one

e war (in
per rupee

t 5½ seers

r 3½ seers at Lahore—and

under cotton than would otherwise be the case.

(2) Thus, in the spring of 1916, the peasant found himself short of fodder: the preceding *kharif* had been practically a failure, and there had been very little winter rains to ripen such wheat as had been sown: so he placed, roughly speaking, 2,300,000 acres more under fodder crops than in the preceding year. Even allowing for the fact that the area in the preceding year was low, considerably more than the average area was put under fodder crops. Had the fodder supply been normal, the Punjab peasant would undoubtedly have placed a larger area under cotton, the price of which was then steadily rising.

1244. *Crops which compete with cotton.*—The fodder crops are the principal rivals cotton has, as a *kharif* crop, in this Province. Indeed it would be of distinct advantage to the agriculture of the Province generally had cotton more rivals. Sugar-cane is grown only to a limited extent, is ten months in the ground, and requires better land, more cultivation, more manuring, and more water, than the average peasant can give. Maize also requires land and cultivation distinctly above the average. There thus remain, as groundnuts are not grown here, only the low class pulses (including *guar* and *bajra* for grain) for the *zamindar* to grow in the *kharif*, if fodder crops (including *bajra* for fodder) and cotton be put on one side.

1245. *Importance of the fodder problem.*—More than one Settlement Officer has recently emphasised the importance of the fodder problem in this province. Thus Mr. Whitehead, in his assessment report of the Rupar *tehsil* of the Ambala district (which has just appeared) says "the fodder problem is more serious now than formerly: every square yard capable of profit has been brought under the plough, no pastures worthy of the name are left, and the *zamindar* is compelled to sow more and more fodder in order to maintain his stall-fed cattle." In the all important (especially in the present connexion) canal colonies, practically all the cattle are stall-fed. Better cultivation, which the Agricultural Department is always preaching, to a large extent, means better tillage, and that needs good plough cattle: these in their turn need good fodder: and I must express a strong desire that no recommendations the Cotton Committee may make will, even indirectly, have the effect of decreasing the area now placed under fodder crops in the province.

1246. *Tracts in which an extension of the area under cotton may be looked for.*—In the Punjab, as a whole, considerable increases in the area under cotton can, in my opinion, only be looked for in the following tracts:—

(*a*) the Lower Bari Doab colony, now under colonization;
(*b*) the Sind Sagar Doab, if the scheme for irrigating it from the Indus, now under consideration, matures;
(*c*) the Multan, Muzaffargarh and Dera Ghazi Khan districts, if the inundation canals now irrigating them are made perennial; and
(*d*) the Bahawalpur State, if the scheme for irrigating it from the Sutlej (now under consideration) matures.

1247. *Objections to scheme for doubling canals.*—Mr. Roberts, the Professor of Agriculture at Lyallpur, and now a member of the Cotton Committee, has, I know, a scheme for largely increasing the area under cotton in the canal colonies by doubling the present canals in size. There is ample water in the Punjab rivers, of course, through the summer months to supply water for such canals. There is doubtless much to say in favour of the scheme: but there is, I think, also much to say against it. I have not had time to go into the case thoroughly, but the following points occur to me. Will not Mr. Roberts' scheme accelerate waterlogging? Will the average cultivator have sufficient labour and plough cattle at his command to put that increased area under cultivation which is meant to be part of the scheme? Most important of all, surely the decrease in the wheat area, which Mr. Roberts says is bound to follow the introduction of his scheme, is greatly to be deprecated? It is true that Mr. Roberts says the area under gram is bound to increase. This may well be, and agriculturally is of course, all to the good. Mr. Roberts appears to meditate the Punjab exporting gram to England in place of wheat, and the Punjabi clerk eating *chupatties* of gram. Personally I think both of these eventualities are a very long way off. Nor do I agree with Mr. Roberts that "the need both of India and the rest of the Empire after the war will be more urgent for staple cotton than for wheat." For the rest, I leave this interesting proposal. It will doubtless be fully considered by the Committee. The opinions of engineering officers on it will be particularly valuable.

1248. *Division of province from cotton growing point of view.*—So much for the province as a whole. From however, the cotton growing point of view it can, I think, be divided into more or less distinct tracts. Climatic and economic considerations have been those principally in my mind in dividing the province as follows:—

(1) The Ambala Division (save Simla);
(2) the Jullundur Division (save Kangra);
(3) the Sialkot and Gurdaspur Districts;
(4) the Lahore and Amritsar Districts;
(5) the Rawalpindi Division (save Shahpur);
(6) the Shahpur, Gujranwala, Montgomery, Lyallpur and Jhang Distrcts; and
(7) the Multan, Muzaffargarh and Dera Ghazi Khan Districts.

1249. *Average annual rainfall.*—I commence my discussion on each of these divisions by giving the average annual rainfall (based on the last ten years' figures) at one important place in each of them:—

	Inches.
Ambala	30·31
Ferozepore	14·06
Lahore	20·5
Sialkot	28·16
Rawalpindi	34·6
Lyallpur	15·06
Multan	7·08

1250. *The Ambala Division.*—I now discuss the first of them, (*a*) the Ambala Division, excluding the hill district of Simla. This includes the districts of Ambala, Rohtak, Karnal, Gurgaon and Hissar. On the last ten years' figures, this tract contains 22 per cent. of the total area put under cotton in the province. S. Darshan Singh, Deputy Director of Agriculture, Hansi, in whose charge it is, will doubtless have explained to the Committee in more detail than is necessary for me its possibilities as a grower of American cotton. But I note a few points that occur to me. The rainfall figures given above would lead one to expect the unirrigated

in the Karnal district

(2) Rainfall l e ng thus of great importance in this tract the area under cotton naturally varies with tl e rainfall in 1915 wl en the monsoon was very deficient only 181 300 acres were sown with cotton little less than half tl e average

(3) The size of tl e average holding varies from five acres (in Ambala) to sixteen acres (in Hissar) Cotton is not generally manured in Ambala it frequently follows cane which is of course manured In Hissar,

connexion

small scale In the canal colonies the holdings are large the whole area has been brought under cultivation by selected an l energet c peasants in the last thirty years who are not bound by local tradition as to

without their weigl t in the present connection

have divided the

listricts of Julli n

t containing only

ures given earlier

d stricts of the

total area under

h ana and Feroze

cotton w th the help of ra nwater alone

In tl e th rd of these tracts the Sialkot and Gurdaspur

mall the holdings This

put under cotton in the

he fo rth of my tracts

ble

of

)00

ive

already dealt with

125

d strict

heavy

l with the Rawalp ndi Division, save Shahpur

In the greater part of it the rainfall is too

)o slack to ensure good staple cotton be ng

grown. At present this tract grows between four and five per cent. of the total cotton of the Punjab, and three-fourths of that grown is matured entirely with rainfall. It is possible that a small area in the now developing Upper Jhelum colony of this tract, which is irrigated by the Upper Jhelum Canal, in the south of the Gujrat district, adjoining the Lower Jhelum colony, may grow staple cotton; but the area is not large. Government has agreed, I may note, to reserve an area of about 200 acres in this colony as a seed farm for the Agricultural Department.

(2) If the Sind Sagar Canal from the Indus, already mentioned, comes into being, it will irrigate large tracts of the Mianwali district, where rainfall is scant, and here doubtless American cotton can be grown at any rate on the better land.

1255. *The Shahpur, Gujranwala, Lyallpur, Jhang and Montgomery Districts.*—We now come to my fifth tract, containing the Shahpur, Gujranwala, Lyallpur, Jhang and Montgomery districts. This contains the Canal Colonies of the Province and contains practically all the area under staple cotton at present. The conditions are the most suitable to that crop that we can find in this Province. The rainfall is generally not excessive: the holdings are large: and the "commercial" agriculture already spoken of is practised. But even here I am inclined to think that on the inferior lands, and on the tails of the canals, a certain amount of short staple *deshi* cotton will always survive. This tract contains thirty per cent. of the area under cotton in the Province, practically all grown with the help of canal irrigation.

1256. *The Multan, Muzaffargarh and Dera Ghazi Khan Districts.*—The last of my tracts, the Multan, Muzaffargarh and Dera Ghazi Khan districts, is also suitable for cotton growing: some of the best of the country cotton now grown is found in it. This tract has an insignificant rainfall, and contains about twelve per cent. of the total area under cotton in the Province. Practically all of this is grown with the help of artificial irrigation, nearly all from inundation canals. If cotton that has to be early planted, as is the case with staple cotton. according to our present information, is to flourish here, steps should be taken to ensure a more regular water-supply. Inundation canals generally start running too early and stop running too soon for this crop. It must, however, be borne in mind that most of the peasants of this tract are Muhammadan, with a low standard of cultivation.

1257. *The Bahawalpur State.*—The large Bahawalpur State, which adjoins this tract, offers great potentialities of cotton growing, so far as soil and climatic conditions go, if the irrigation proposals now under the consideration of Government, come to anything. Mr. Renouf, formerly Director of Agriculture, and at present Resident in that State, might well, I think, be examined on this point. I imagine, however, that the cultivators are generally bad, resembling the Sind is, and that they are not very numerous.

PART II.—ANSWERS TO COMMITTEE'S QUESTIONS.

I.—Agricultural Experience.

(a) "*Deshi*" *short-staple cotton.*

1258. **(4) Yields and profits.**—I have now surveyed the province as a whole: I will now go through such of the specific questions of the Committee as I have anything to say on.

(2) Mr. Hamilton, late Director of Agriculture, in a valuable note (I will give the Committee a copy), worked out a calculation to show that cotton gives a net profit per acre in the Lyallpur district of Rs. 42-9-6 per acre. He assumed a price of Rs. 8 per acre of *kapas*: the present price is of course much higher. I am inclined, however, to think that his assumed yield of nine maunds per acre is rather high as an all-round average.

1259. **(8) Uses of seed and seed selection.**—Seed selection is practised hardly at all outside the canal colonies. Mr. Fulkner and Mr. Fatehudin will doubtless have explained to the Committee the methods by which the Agricultural Department control their seed. In view of the great value of the cotton crop to the Province, I should like more seed farms, entirely under the Agricultural Department, and to be used altogether as such, than is at present the case.

(b) "*Deshi*" *long-staple cotton.*

1260. **(11) Varieties.**—No *deshi* long staple cotton is being pushed in this Province. I would most strongly deprecate doing so, unless absolutely necessary. The fewer kinds of cotton we go in for the better.

(c) *Exotic cotton.*

1261. **(28) Importation of seeds.**—Our experience recently on the Economic Botanist's section at the Lyallpur farm shows that the importation of cotton seed direct from America is far from likely to produce satisfactory results, at any rate at first.

II.—Commercial Aspect.

1262. **(30) Local trade customs.**—The cotton auctions we hold undoubtedly have their value, as helping the smaller growers to get a full price for their cotton. But we cannot carry them beyond a certain limit. Sardar Jogendra Singh of Iqbalnagar tells me that he is going to hold a cotton auction there in January: his experience at it will be valuable. He has, however, asked me for the services of an agricultural assistant to help him in classifying the cotton. So he feels that he cannot as yet stand alone.

III.—Statistical.

1263. **(35) Publication of Liverpool and Bombay prices.**—We have this year started publishing cotton prices at the principal markets. So far our experience of this work is satisfactory.

1264. *Control of ginning factories.*—Control of ginning factories is urgently required: whether it will be found possible to control those already erected, bearing in mind the fact that they are already in existence, and various other considerations (including political), is another matter. The case is different as regards those to be erected on any lands, but especially Crown Lands as in the Lower Bari Doab colony in the future. This Government is considering the case, and the Committee is already in possession of our proposals in the

matter The

the matter might be investigated further
1266 [illegible]

up on the lines just indicated . and I think I may say they are an improvement on their predecessors

VI —Irrigation.

1268 (56)
without tubes

the canal *patwaris* were kindly recording for me the areas under American and country cotton separately in the Gujranwala district, the Deputy Commissioner informed me that the peasants were showing a certain amount of alarm, thinking that Government was going to put a higher water rate on American cotton Hence I make this suggestion

I must apologise for this ill arranged and disconnected character of this note.

Annexture I

Statement showing figures of cotton (American and deshi) for Kharif 1917 by Canal Circles

Canal Circle	American cotton	*Deshi* cotton.	Total	Remarks
	Acres	Acres	Acres	
Lower Jhelum Circle	35,292	57,999	93,291	In this statement are not included canals, such as the Western Jumna Canal, the Sirhind Canal, and some other smaller canals principally inundation, on which, as yet at any rate, no American cotton is grown.
Upper Jhelum Circle	3,181	22,684	25,865	
Upper Bari Doab Circle	1,257	9,675	10,932	
Lower Bari Doab Circle	90,342	65,846	156,188	
Upper Chenab Canal Circle	8,926	20,960	29,886	
Lower Chenab Canal Circle	137,209	101,577	238,768	
Derajat Circle (Sidhnai Canal)	743	42,382	43,125	
Total	276,950	321,123	598,073	

The Hon'ble Mr. C. A. H. Townsend, I.C.S., called and examined.

1270. (*President.*) I endorse the opinion of Mr. Calvert that the economic aspect of agriculture is of great importance and I am undoubtedly inclined to the view that the study of agricultural economics should be taken up. I may say, in this connexion, that we are embarking on a small scale on that line of work. Government has recently sanctioned the appointment of an Assistant Professor of English for the Agricultural [illegible] is by no means a whole time job. We have got a man appointed who was strongly [illegible] Jevons for economic work, and, in addition to his ordinary work, he will devote special attention to agricultural economics.

1271. I take the view that in the Punjab a primary condition which any new agricultural scheme must satisfy is the maintenance of the fodder supply and that, secondly, the wheat crop is of greater importance in the Province than cotton. I have been very closely in contact with the wheat question during the last three years and I know how much importance attaches to it.

1272. I am pessimistic about cotton cultivation only in regard to certain tracts. The most favourable area for cotton cultivation is the canal colonies in which cotton is at present being pushed. As to cotton in Hissar, I have known three years in which cotton had a serious throw back. In 1905, boll-worm was very bad indeed; in 1909, we had very heavy rain and again, in the present year, we have had excessive rain. Another drawback to growing American cotton in the district is the fact that cotton is put in immediately after the *rabi* crops. As American cotton has to be put in earlier than *deshi*, the land is not ready in time. On the other hand, the holdings in the Hissar district are considerably larger than in the rest of the Province except in the canal colonies, but the standard of agriculture is generally low.

1273. The Punjab Agricultural Department has made considerable strides during the last few years, but it is undoubtedly very considerably handicapped by shortage of staff, both superior and inferior. Mr. Southern has been reported as missing and, at present, we cannot obtain any officer to replace him. A proposal has gone to the Government of India for two more Imperial officers and when I sent it up, I stated to the Punjab Government that my sole reason for asking for only two superior officers was the difficulty in supplying them with subordinate staff. Our capacity for absorption at one time is limited. If we were to be given four Imperial officers at once, it would be very difficult to absorb them, to train them and to give them sufficient staff. As regards the difficulty of giving them sufficient subordinate staff, I must point out that, a few years ago, the Agricultural College had practically no students. This is the first year in which we have had a fourth year class. A few months ago, Mr. Roberts told me that he could recommend me only two men for the posts that were vacant. I have at present a post which is empty and which I cannot fill. This of course is only a temporary and passing phase. I will wait till next May when the new class passes out. I should like to see a very considerable extension indeed of the Department. In this connexion, I should like to point out that, in addition to being the Director of Agriculture, I am also Director of Industries and Controller of Munitions. There is room for a whole time Director of Industries. In addition to this, I have got a larger veterinary staff than any other province in India which has considerably developed in the last few years. The Punjab Government is generous and any proposals sent up by me are generally sanctioned. There has therefore been considerable development in the last few years. But I find great difficulty in filling up the lower ranks of the Agricultural Department. That difficulty should disappear in the next few years. When the Agricultural College was started some years ago, there was then only one Deputy Director who was stationed at Gurdaspur. He had charge of the whole province. It was by subsequent development that the district work in these canal colonies was given to Mr. Roberts, Principal of the Lyallpur College. My predecessor gave him charge of district work of the Lower Chenab Colony and I subsequently added the Lower Bari Doab Colony to his charge. Another Deputy Director was appointed and he was placed in charge of the districts round Hissar. The Deputy Director at Gurdaspur has claimed to be in charge of the rest of the province and nominally he is so but I would point out that in many of the districts of which he is nominally in charge, there is no work going on. I would also point out that this division of the province is not entirely accurate. The Deputy Director at Hansi has charge of the circle, Hissar, Gurgaon, Rohtak, Ferozepore, Umballa and Karnal, six districts in all. The Deputy Director of Agriculture here is responsible for the work in the districts of Lyallpur, Jhang, the southern portion of Gujranwala, Montgomery, Multan and to a small extent, Lahore. I have recently added to his circle the districts of Mzzafargarh and Dera Ghazi Khan, because they link on to Multan. There is no work going on in them at present. At present the Deputy Director of Agriculture, Gurdaspur, has charge of the rest of the Province. A Deputy Director of Agriculture has been sanctioned by the Secretary of State for the north-west part of the Province, principally with a view to encourage wheat cultivation there and the primary idea underlying the appointment of Mr. Faulkner was that he should be in charge of that circle. I hope that he will be so in time but for the present it is necessary to keep him at Lyallpur to help Mr. Roberts in his work on American cotton. The arrangement, therefore, is that the Professor of Agriculture has a considerable amount of district work in which he is assisted by a Deputy Director. I am not prepared to say that this arrangement is ideal, but it is working satisfactorily.

1274. As to the point at which the work of the Economic Botanist should terminate, *i.e.*, the stage at which he hands things over to the Deputy Director of Agriculture, my predecessor acted on the advice of Mr. Mollison who laid down that the Economic Botanist should only grow crops on half an acre of land, his view being that if a crop was worth trying on a larger area that trial must be made by the agriculturist proper. Mr. Milne frequently spoke to me about this limit and I withdrew it, adding to his area at the same time 27 acres of land. My view is, however, that experimental work on fairly small plots should be done by the Botanical Department and the trials on any large field scale should be made by the agricultural staff. Personally, I am by no means in favour of the botanical staff carrying our experiments in *zamindars'* lands. It appears to me that it would obviously be inadvisable. I know the system followed at Cawnpore. I should like to know how far the seed on Mr. Leake's seed farm is seed approved by the agriculturists. Mr. Leake has an area of 165 acres in all; 35 acres under purely experimental work at Cawnpore and 130 acres of seed farm at Aligarh. Mr. Milne has an area considerably smaller but very much more than other botanists. He has 87 acres. In Bengal, I find that the botanist has 19 acres. The Economic Botanist in the Central Provinces has an area of three acres and two additional acres lent him by the agriculturists, *i.e.*, five acres in all. His staff at Nagpur consists of one half-time man for teaching and research, two men entirely on research and one man in charge of the garden. Mr. Leake's staff for his 185 acres consists of one Assistant Economic Botanist and one overseer. Mr. Milne's staff consists, apart from his teaching staff, of four whole-time men and one half-time man. My impression is that one of the whole-time men is used for teaching though

he was given for research, but that is his own arrangement If there is co operation between the Economic Botanist and Deputy Directors, there should be no difficulty about the dissemination of the seed

1276 I would have the ginning and press returns made compulsory. At present they are worse than useless

1277. The suggestion in the last paragraph of my written evidence that Government should announce that, say, for ten years to come no additional land revenue or water rates should be charged on long staple cotton as compared with short staple would have a reassuring effect on the cultivators. I certainly got

agricultural experts and representatives of the trade

1279 (*Mr Roberts*) Conditions since 1914 have been abnormal. At present they are marked by exceedingly high prices of cotton. Various landholders have told me that next year they will put a smaller area under wheat and more under cotton. Of course, that will lead to a steady development of cotton in

to the scarcity of fodder A great deal depends on the fodder supply I should hesitate to put possibilities as high as two million acres if the price is on the level of 1911 14 It might go to 1,800,000 acres

has not therefore allowed sufficiently *for the expenses of cultivating wheat. Even with these limitations*, his figures give a fairly good idea of the relative value of the two crops It is very difficult to work out the cost of cultivation.

cross breeding goes on I am urging the District Boards to buy more bulls These colonies draw on the older tracts I consider it would be sound if there were an increase in the fodder tracts in this colony from the point of view

the ultim

increase

less cott

up together.

crops. If it is a Jat village in which the people come from Amritsar, they would put more under sugarcane and maize The Muhammadans, as a rule, put a larger area under fodder crops than Sikhs. With crops like sugarcane and maize, you cannot increase the intensity to any great extent. Sugarcane cannot be grown without manure It is very hard to get a *rabi* crops to follow maize Very little maize is grown in these colonies It is not by any means an important crop in *them The principal increase would be under wheat* and cotton. With cotton and wheat, you cannot get over a hundred per cent. intensity Any higher intensity must mean double cropping and that one of the crops must be a fodder crop which is all to the good.

or wheat; but only to a small extent for cotton. The discretion exercised by the Secretary of State in regard to freight is in favour of food grains rather than of cotton.

1284. With regard to waterlogging, I should say that if you increase the canals, it increases the tendency to waterlogging. All the evidence of the engineers goes to show that waterlogging does not happen from the field-channels, but from the canals; unless you line the canals, waterlogging will therefore increase. If you line the canals, much of my objection on that point disappears. It is a very difficult question but new canals can be lined as they are made.

1285. In the event of this or any of the canal colonies producing more fodder crops, I do not think that there would be any less demand for *bhusa*. It is quite possible that it will not be required in its present quantity but I know an enormous lot of *bhusa* is being exported now for military requirements. Fodder crops would, however, be of more value than *bhusa* and would provide legumen. I think that Mr. Faulkner brought out in his evidence that we have reached a stage of equilibrium in the colonies according to the present capacity of the land, bullocks and labour. The cropping varies from *chak* to *chak* according to a man's experience but one would always like to see more leguminous crops grown.

1286. I have already said that there should be an increase in seed farms for cotton if cotton is to increase outside the canal colonies. There are no large estates in the Upper Jhelum Colony or in other parts of the province. I should always like to have a certain number of seed farms under our own control. The Sargodha farm is partly seed and partly experimental. I would like to have seed farms of 200 acres on which we could always rely. Control of seed to an extent sufficient for 20,000 acres would be better than nothing. I would like reserve seed farms always under our own control. As to whether I would emphasise the importance of seed emanating from one centre or would like seed farms selecting independently, I would leave it to the Deputy Director in charge of the work. So long as he was satisfied that the same type of seed was being selected, I would leave it to him.

1287. 4-F is not absolutely a pure line from the point of view of selection work. Selection in different places might lead to different results. That is a point which has to be watched very carefully.

1288. Great inconvenience is caused in sending seed from Lyallpur to Montgomery, owing to the difficulty of railway waggons. That is a temporary difficulty but it has to be borne in mind. We must always have a central seed farm, but I would rather have a certain amount of seed grown at Montgomery and Sargodha under our own control than import it all from Lyallpur. So long as the seed grown is of good quality there is no necessity to import it from Lyallpur. If Lyallpur gives better seed than Sargodha, I would certainly send for improved seed. I am quite prepared to put Montgomery and Sargodha in the same circle as Lyallpur. The Agricultural Department is always developing, and it is impossible to say what the agricultural position will be ten years hence.

1289. As regards the effect of *kalar* in the Punjab, I would not say that it is a very big question but it is a big one. Mr. Barnes worked on it at Narwala and we are awaiting the results of the experiments there. Mr. Barnes was about to write a detailed report on them when he died. Personally I would not emphasize mole draining at all. Mr. Barnes himself admitted that it was unnecessary. The land is infinitely better than it was four or five years ago. There are very large areas of *kalar* land that might be taken up. There is a *kalar* problem in the United Provinces as well as in this province. For the last thirty years spasmodic efforts have been made to deal with the problem but there has been no co-ordinating link. An enormous lot of spade work has undoubtedly been done by the various provinces. If there had been a co-ordinating link, the experience of other provinces would have proved of great use. I do not know whether the Government of the Punjab is in favour of a co-ordinating link, as I do not think that the question has been raised. I do not think that the problem should be left to each Provincial Government. I certainly think that the Imperial Agriculturist can give us most useful advice on the matter. There is a great deal to be said in favour of the view that the question is one of water supply. One fact that I should like to point out is that when I was Settlement Officer of Hissar, the *kalar* question was so serious in certain villages that the Punjab Government reduced the water supply and *kalar* entirely disappeared as a result of the decreased water supply.

1290. We do not know the amount of cotton that is baled, as we do not get accurate statistics. If it were made compulsory on all presses to submit their returns we should then be in a very much better position. We know the amount of cotton that leaves by rail.

1291. Whatever the figure of outturn is, it is fairly low. It is, in Hissar, 5½ maunds to the acre. We cannot extend our area very considerably except in the south-west of the province. The first thing there is to improve the outturn per acre. We always work out the correct rotation, but the difficulty is to get the people to adopt it. It is a fact that our water is more or less limited and we want to increase our intensity. The *rabi* intensity is very limited. As regards the *kharif*, there is a great difference of opinion between the two schools of thought. One school maintains that there is no demand for more water and the other school maintains that there is an abundant demand but there is no supply. We are working at the improvement of outturn but it appears that it will take considerably longer to obtain such obvious results as have been obtained in improving the quality. I would not say that the future of the Punjab depends on getting out some suitable and economic rotations, though I quite agree that is very important. In Hissar, where fallows are frequent, I do not see any great signs of deterioration. Fallows are compulsory, owing to the absence of rain, in those parts of the Province which do not get artificial irrigation. In the Colonies, it seems an undoubted fact that the output per acre is not what it was twenty years ago. How far this is due merely to the fact that it was a virgin soil at the outset and how far it is due to deterioration, I am not prepared to say. Personally, I am inclined to the opinion that the first factor is the more important and that a position of equilibrium has been reached. I do not think that the outturn is less than it was five years ago. I have studied the outturns of wheat as compared with those in the United Provinces.

1292. (*Mr. Hodgkinson.*) As to whether I would advocate an increase of one hundred thousand bales of long staple cotton or an increase of half a million bales of short staple cotton, it all depends on which would pay the cultivator better. Our sole *raison d'être* is to bring more money into the pockets of the peasants. Our present experience is that the long staple cotton 4-F brings more money into the pockets of the cultivators and therefore we are pushing that. I think that in 99 cases out of 100, the long staple cotton would pay the cultivator better than the short staple and so long as it does so, I am entirely in favour of it.

1293. The question of the control of ginning factories is a difficult problem. Apart from other considerations, you have to bear in mind the political aspect. I would divide the matter into two parts, namely, ginning factories already erected and those to be erected in the future. Personally, I do not see how mixing can be stopped in an average factory if the factory owner wishes to do it. It is no good asking for legislation because you do not want to flood the country with an army of inspectors.

1294 Ginning and pressing returns together with railway returns would be of great use We do not know the exact amount of cotton used in the province for domest c consumption and a certain amount of cotton leaves the province by road Our statistical returns will not be complete until we get returns from presses.

129› (Mr Wadia) The best expert opinion of the Irrigation Department is that lining of channel will prevent waterlogging The best opinion is that waterlogging is not due to the water that has perco lated from the fields but to the water that has passed from the unlined canals Another evil is according to the sanitary people that the more you flood the country the more you bring mosquitoes and the more

[illegible]

is very slow in this matter, but it is developing The matter is receiving attention and the Financial com missioners recently issued a revised circular on the subject, some of which I helped to draft Legislation would be at present, I think inadvisable

1297 We are working principally on the improvement of deshi cotton at our Hansi farm at present

[illegible]

opportunities for corruption

[illegible]

able to fix a maximum price for ginning and pressing. But the factory owners will always get round i me way or other as for example by dealing through *arhtyas*. It would be very difficult to work. I quit he point of the proposal, but I see many difficulties in getting a remedy. I would leave things alone as rds the existing factories. The evils are perhaps less harmful than the remedies proposed for dealing h them.

1303. If pure cotton has to be grown all over India, the multiplication of seed farms would be a tremend- a business for the time being. In this province, the work will be facilitated by the large estates in e tracts where we are pushing on American cotton. The production of pure seed is eminently one of the nctions of the Agricultural Department. Until seed farms are established, seed must be bought from the nneries. If the factory owners do not sell pure seed, the cultivators cannot get it. There is another emedy which is that you might get hold of some of the large estates such as we have and get them to sow pure seed You might adopt another policy under which the ginning factory might be given a small premium for pure seed. Seed Unions with a small ginning factory of their own would be another way of dealing with the matter There are several of them in the Central Provinces but I do not suggest that Mr. Clouston's methods there could be applied all over India. I agree that the production of pure seed is a most importar question but I would hesitate to lay down any hard and fast policy. I would direct the attention of th Agricultural Department to it and let each province find its own salvation.

1304. As to the question of weights in the ginneries, the Municipal Act of this Province provides for the inspection of weights and measures but it leaves it entirely to the municipal authority. The only Imperial Act on the subject is the Weights and Measures Act which applies to the whole of India. So far as I can ascertain no rules had been framed under it by the Punjab Government and the Act is a dead letter in this Province. About four years ago, the Government of India appointed a Committee which toured throughout India to investigate the question. Unfortunately the Committee did not agree and there has been no result. The Inspector of Factories has no legal authority to examine weights. If he starts doing things outside his own work, he will at once get into trouble. If anything could be done to put the inspection of weights and measures on a better footing, it would be most advisable, especially, in the case of factories outside municipal areas. There are lots of factories outside municipal limits especially in the Hissar district. Nobody looks at them. The Municipalities can pass bye-laws for those in municipal limits but in most cases, they prefer to leave it alone. In some cases, bye-laws have been passed but nobody pays any attention to them. If ginneries were licensed, one condition should be that only standard weights were kept.

1305. Even if the formation of pools were prohibited by law, a good many of irregular pools would be formed without anyone knowing anything about them, until the members fought among themselves and came into the law court.

1306. As to the auction sales, I am not prepared to say that the classification into A, B, C, and D classes made by the Agricultural Department at the auctions is always accurate, but in the majority of cases it is very fairly accurate, and I have been very much struck by the absence of complaints. The staff which goes round to these auctions gets fairly skilled in the work. According to expert opinion, it is exceedingly difficult to tell the percentage of *deshi* in American cotton in the case of a lint but in *kapas* it is quite easy for a skilled man to do it The auctions work very fairly well as a whole considering the limited staff we have got and considering the hold that the brokers have over the peasants. The staff do their work very well indeed. It is carefully supervised by Mr Faulkner and Mr Fateh-ud-din and I get very few complaints.

1307. I have already said, in reply to the President, that we require an increase in the staff of the Agri- cultural Department. A Deputy Director for each district is not yet required. That would mean 29 Deputy Directors in this province Our difficulty as compared with the Central Provinces is that there is no separate tract for each crop here as there, where they have rice, wheat and cotton tracts; we have got wheat all over the province We certainly want more Deputy Directors. It is no good embarking on a seed farm unless you know what you are going to give out. You have got a lot of research work to do in the first instance. In the Ferozepore district, 4 F was a failure. We want staff in Jang and Gujranwala. I have got four additiona posts sanctioned but I have not at present got the men to fill them.

1308. As to the facilities at present in the Lyallpur College for training Indians, we have remodelled o curriculum at intervals We have a four years' course in English divided into two parts, two years in eac A man can enter the two years' course separately; the better men who go on for another two years' cou are eligible for posts carrying Rs. 120 in the Agricultural Department. At present, I have no reason to co plain of the stamp of men turned out. For the last two years we have had examiners in agriculture fr other provincial colleges in India and they have always reported well on the teaching in the college. college could not train men fitted for appointments in the gazetted grades of the Agricultural Departm I would not recommend that our college should give such a training. Our work is to provide agricultural as ants for the subordinate staff, to train men such as managers of estates and also to train *zamindars* wish to manage their own lands. The recommendation of the Public Services Commission could n carried out in this province. This is my personal view.

1309. I would develop the teaching side at Pusa more than is at present the case. There sho one central place for teaching for the whole of India. We sent some of our men to Pusa and they al back better men. I should like the post graduate teaching at Pusa developed. Our research staff is up with the agricultural staff and district work. The Professor of Agriculture, his assistant, and t extent the Botanist and Chemist have research work as well as district work. The subordinate staff ar cally entirely engaged in teaching. The Assistant Professor of Agriculture has no direct work on th If the Principal of the College has an assistant, his relations with the students are not affected by that he has outside work. The Principal is here for a good deal of time and takes an active part in I do not know the position in other provinces. I would deprecate the idea that the college staff restricted to the college farm and not have any district work. Mr. Roberts and I personally at importance to the connexion of college work with district work. It brings a man in touch with living There are advantages in knowing what is going on in the district.

1310. As to the question of the prohibition of bone meal manure, the point was raised be late Mr. Barnes on the question of phosphatic manures. So far as experience goes with any artific it has been proved that it does not pay. Superphosphates generally accelerate the growth of th in no case, to the best of my recollection, has the extra produce that has been obtained as a result o paid for the cost of it. I have no sufficient data in regard to the prohibition of bone manures.

Mr. MADAN MOHAN LAL, Assistant Professor of Entomology, Punjab.

EXAMINED AT LYALLPUR, JANUARY 16TH, 1918.

Written statement.

... and thus reduce the vitality of plants.

1312 *Varieties of bollworms* —Of bollworms there are two main kinds —

(1) *The spotted bollworms* consisting of two species—*Earias insulana* and *Earias fabia* Here *Earias insulana* occurs mostly Both these species are *practically identical in habit. This kind is the bollworm* of the Punjab

(2) *The pink bollworm* (*Gelechia gossypiella*, Saund) —This occupies a minor position and is found mostly in the cold weather

1313 *The spotted bollworms* —The spotted bollworms attack the cotton plant from May to November early in the season buds and flowers are attacked · they dry and fall off From August onwards the crops of bolls are attacked, they either do not open or yield bad cotton

(2) *The prevalence of bollworm appears to be dependent upon two factors* —

(i) The monsoon rains.

(ii) The parasites

(i) in years of good rainfall, the pest does not increase, as all tendency towards it receives successive checks;

(ii) in years of drought, the pest does much damage, as it increases brood after brood almost without any check.

1316 *Methods of controlling bollworm* —We cannot be certain of the timely working of the above mentioned natural agencies and hence in order to control bollworms, we should attempt—

(i) to destroy its early broods in cottons buds and flowers and early bolls during June and July;

(ii) to introduce the parasite *Rhogas* in cotton areas in August

1317 (a) *Destruction of the early broods of bollworm* —Regular hand picking of affected parts gives very good results but it is a slow and tedious process and people do not willingly take to it

(4) *Beneficial effects of parasite boxes* —Parasites introduced in this way in August exercise a controlling effect upon bollworm The results of the last two years' work show that—

(i) parasites are invariably established by the use of the parasite boxes.

(ii) bollworm attack is less in those fields in which the parasites have been introduced than in the adjoining fields of similar cottons grown under similar conditions from which the parasites are absent

The following data will give some idea :—

Locality.	Bollworm per cent. before parasite introduction.	Bollworm per cent. after parasite introduction.		
		After 15 days.	After 20 days.	After 30 days.
Sargodha	31 per cent. on 6th August.	22	17	7
Do.	17 do.	12	8	3
Do.	15 do.	13	6	5
Lyallpur	25 do.	18	11	5
Do.	17 do.	11	9	3
Do.	25 do.	19	7	2

When the parasites have had some time to work, the bollworm attack is reduced.

1319. *Relative intensity of bollworm attack on different kinds of cotton.*—This is another important line of work. We have not gone very far with this but comparative results obtained during the last years show at least this much that American cottons as a class are considerably less attacked than the *deshi* cottons. In normal years the attack is as follows:—

Time.	Attack in Americans.	Attack in *Deshis*.
August	3 per cent.	12 per cent.
September	5 "	15 "
October	7 "	19 "
November	5 "	17 "

The attack varies slightly in the Americans according to their proximity to the *deshi* cottons.

1320. *Other insect pests.*—(1) *Gelechia gossypiella*, Saund.—This is not a serious pest in the Punjab. It is found in the fields about the end of the cotton season—in Ocotber—bores into the bolls and eats the seed. It prefers the Americans to the *deshis*. In no case has a control measure been necessary.

(2) *Desdercus cingulatus (Fabr.) and Oxycarenus latus* (Kirby).—These are the two bugs. The first one attacks the green and open bolls and suck the juices out of the lint and seed. The loss becomes apparent when the cotton is picked and ginned. The second bug is found in large numbers *in open bolls.* Both these bugs are conspicuous and remain clustered together. They are easily dealt with by jerking them off the plants in basins of water.

(3) *Sylepta derogata.*—Mostly attacks exotic cottons by rolling up the leaves. Spraying with lead arsenate has given good result on experimental cottons. On field scale, the simple remedy of picking off the rolled up leaves as soon as they are seen is recommended. When it is done in time it is effective.

Mr. MADAN MOHAN LAL called and examined.

1321. (*President.*) Normally we find that there are certain conditions chiefly the (i) timely monsoon rains, (ii) natural presence of parasites, which will keep bollworms in check but when these factors fail they increase enormously. Damage by bollworm has not been serious since I came here. I have been Assistant Professor of Entomology for the last six years. During that time bollworm has never become serious. The last serious outbreak was in 1911, just before I came. I am working on that special line of work but I have been very short of staff, and the result has been that we had not time to devote ourselves whole heartedly to solving this problem. So many insect pests are appearing at different times of the year that we have to practically rush from one thing to the other. The remedies we adopted are the use of the parasite, *Rhogas spp.* and treatment at the beginning of the season in June or July either by hand picking of the affected bolls or by drawing an extended rope over the tops of the plants and then irrigating the fields. The effect of the latter is that when the plants are shaken in this way the affected bolls and buds being weak drop off and as cotton is mostly grown in irrigated area, the boll worms get drowned in the water. There is no insect pest so serious as bollworm. Sometimes we find the red cotton bug.

1322. I had one assistant on cotton work. His main work was the distribution of the parasite boxes in the cotton season. At other times of the year I had to put him on other work. I have got another assistant from Pusa, Mr. Umrao Bahadur: I have put him on to bollworm work. He will have to help me in class work in Entomology and whatever spare time he will have from it, he will give to bollworm work.

1323. We recommended hand picking for bollworm but the cultivators do not give much assistance either in that or in the rope work. It is rather tedious work finding out the infected bolls and picking them out.

1324. As to the parasitical work, the introduction of *Rhogas* in the infected areas is being done by the Department. We want a large extension of the subordinate staff especially of agricultural assistants. The agricultural assistants assist in this work and it is mostly being done where there are agricultural assistants with sufficient staff for district work. A lot of work is still required to be done in working out details regarding bollworm and the immediate necessity for that is the appointment of a whole-time assistant to work under me entirely on this problem. For the parasite distribution work in the districts additional staff should be given to the district agricultural assistants. The present staff under them is inadequate to meet even the agricultural requirements and in most cases they cannot take up this extra entomological work

Mr W. S HAMILTON, Deputy Commissioner, Karnal and late Director of Agriculture Punjab

This witness was not orally examined

Written statement

13?? *Prospects of cot in the P n ab* —I do not th [illegible]

VI.—Sind.

Mr. C M Baker, Special Collector for Settlements, Sind

Examined at Karachi January 19th 1918.

Written statement

1327 (65) Experience —I have served seventeen years in S nd and five in Nasik District I have done a good deal of Settlement work and am doing it now Nasik conta ns four *talukas* of the Khandesh cotton country and has a great deal of irrigation some from Government canals and some from village dams In Nasik however no one ever irrigates cotton except occasionally in famine years. *Kha t lesh* cotton does not want much water and they think the rain enough for it In Sind of course all cotton is irrigated (though I have seen it grown on the banks of the Indus in Upper Sind on subsoil water alone)

1328 (67) Cotton *versus* wheat —I had not seen the real cotton growing parts of Sind before the [illegible]

[illegible]

average outturn of the whole area is reckoned at six maunds per acre But an ordinary good crop on ordinary good soil is in my opinion not less than ten maunds At present price this is worth more than Rs 140

(2) If such prices continue the cotton area may increase At present it is nearly confined to the country between the Indus and the Nara from latitude 25 to 26 degrees north If it spreads it will probably spread northward through the Nawabshah district

[illegible] nd more cer [illegible] us I do not [illegible] ifficulty does [illegible] course the [illegible] of excellent [illegible] ice is an ex

[illegible] But seeing [illegible] I think the [illegible] h a yield

[illegible] habit hav [illegible] But they [illegible] n areas for [illegible] mes This

seasons The existing population of the country is supposed to be suffi ient but I do not know much about

in scattered patches that could be colonized I thin scattered all over the tract as they would be wanted to

rabi crops quicker than the people on the ll except the Punjabis and a few of the old

---

Mr. GUL MAHOMAD ABDUL RAHMAN, Acting Deputy Director of Agriculture, Sind

Examined at Karachi January 21st 1918

Written statement

I —Agricultural Experience

(a) '*Deshi* short staple cotton

1347 [illegible]
official cap
1348 [illegible]

known by the name of [illegible] It has gives a higher ginning percen rupee more per maund than the eed selection by picking healthy nd then hand ginned The land

about fifteen acres to several thousand acres The proportion of the holding under cotton [illegible] influenced by the availability or otherwise of irrigation water in the beginning of the season Under favourable conditions the figure may reach up to one third of the total holding

1350 (4) **Yields and profits**—The average yield per acre is about five maunds The profit would depend upon the market but with a price of Rs 10 per maund of 82 lbs the average net profit may come to Rs 20

grown in Sind so no comparison of

the cultivator would rather like to grow rice if he could help it, as the latter is considered to be less expensive, requiring less labour and being more paying. He would however prefer cotton to *juar* and *bajra* in cotton districts. The percentage of profit as compared to that obtained from the last named crops may be about thirty in favour of cotton.

(2) *Triumph*, the only exotic American cotton grown as field crop in Sind has so far never received its intrinsic value through the hands of buyers and, as *deshi* cotton under similar conditions often yields from five to ten per cent more, a much higher premium than so far paid for *Triumph*, *viz.*, from Rs. 1-8-0 to Rs. 2-12-0 per maund, will be necessary to make it equally or more profitable.

1353. **(7) Conditions affecting increase in area.**—The factors which cause fluctuation in the area under *deshi* cotton are (*a*) irrigation, and (*b*) price per maund of seed cotton in the previous season. With good water supply in the beginning of the season, the area under cotton may reach its normal limit and if the prices in the previous season have been good the area in the succeeding year might increase.

1354. **(8) Uses of seed and seed selection.**—*Deshi* cotton seed is put to the following uses:—

(*a*) Sowing, (*b*) cattle feeding, (*c*) export.

There is no seed selection practised except in the Bhitshah tract where big and healthy looking pods are selected from standing crops and then hand ginned.

1355. **(9) General economic conditions.**—Hand hoeings in fields sown broad-cast according to the prevailing system is generally very expensive owing to the general scarcity of labour. This problem could perhaps be tackled by sowing cotton in rows to admit of hoeing operations being carried out by bullock power. Selection of seed and better cultivation are the other improvements for the better yield of the crop.

(*c*) *Exotic cotton.*

1356. **(21) Varieties.**—The *Triumph* variety of cotton is grown in Sind.

1357. **(23) Comparative returns.**—The average yield of *Triumph* American cotton is about four maunds of seed cotton; the profit depends upon the market value of the crop. Please see reply to question 6 (*b*) and (*c*) (paragraph 1352).

1358. **(25) Conditions effecting increase in area.**—The conditions affecting increase in area are the availability of irrigation water from April to the end of the *kharif* season and establishment of buying agencies with sub-agencies in the villages to enable cultivators to dispose of, as in the case of *deshi* cotton, their produce on the spot. These agencies should be prepared to make forward purchases also as the cultivators are in the habit of making forward sales long before the crop is ready in order to meet the current expenses of cotton cultivation. These agencies should have ginning factories of their own for the separate ginning of this cotton.

1359. **(26) Suitability of existing varieties.**—Comparative tests, so far carried out, on farms show that *Triumph* does best under irrigation in the District.

1360. **(27) Prevention of mixing of different varieties.**—To prevent mixing, there should be separate ginning factories for exotic cotton and the practice of mixing, if any, by *zamindars* might be discouraged by paying much lower prices for the mixture. As to the mixing in ginning factories, introduction of legislation may be necessary.

1361. **(28) Importation of seed.**—I am unable to give any definite opinion on this. *Triumph* cotton seems to have partially lost some of its characteristics after the fourth year of its growth. About thirty per cent. of the bolls have turned smaller in size. This may be seasonal only or there may be mixture in the seed.

1362. **(29) General economic conditions.**—Establishment of buying agencies and Government and private seed farms to produce pure seed in large quantities will be necessary for the development of exotic cotton. These farms should be under the supervision of a responsible officer of the Agricultural Department with the necessary number of assistants to help him. In fact the whole concern, *viz.*, ginning, sale and purchase of cotton distribution of seed and the inspection of crops should be under the strict supervision of this officer.

II.—Commercial Aspect.

1363. **(30) Local trade customs.**—When cotton crop is from two to three months old, large forward sales are made by cultivators at rates generally lower than the current market price and they obtain an advance of Rs. 2 for every maund of 82 lbs. sold, to meet their cultivation expenses. Messrs. Ralli Brothers do not, however, give any advance though they make forward purchases. When the crop is ready, sub-agents of local firms purchase cotton in villages and pay for it on the spot.

1364. **(32) Buying agencies.**—The present form of purchasing appears to suit the growers.

III.—Statistical.

1365. **(35) Publication of Liverpool and Bombay prices.**—I think the publication of Liverpool and Bombay cotton prices will be of some help to cultivators provided they reach the very growers of cotton through village officers such as village school masters, *tapedars*, village pound *munshis* and heads of villages.

IV.—Manufacture.

(*a*) *Ginning and pressing.*

1366. **(38) Saw gins *versus* roller gins.**—Saw gins are preferred to roller gins inasmuch as the latter are said to spoil the staple of American cotton.

VI.—Irrigation.

1367. **(65) Experience.**—I have some experience of irrigation under canals so far as it concerns the raising of crops; but I have no experience of canal irrigation assessment work.

1368. **(66) Watering of cotton.**—Preliminary waterings for sowing of cottons are given from May till the sowings are over by the end of June. These waterings are heavier than the subsequent waterings. The first watering after sowing is given after one full month or a little more and subsequent waterings at an interval of about fifteen days. Each volume of water amounts approximately to 12,000 c. ft. The total number of waterings required is six to ten.

1369. (67) Cotton *versus* wheat.—As a rule, the cultivators do not prefer *wheat to cotton, as cotton* at present rates is more paying than wheat Further, with the exception of one or two perennial canals, there is no *rabi* water available and in such tracts wheat is grown as *bosi* on retentive soils only This *bosi* wheat

equal to 33 acres, is cultivated annually as follows —

Kharif season (Hot weather)—
16 acres cotton
1 acre *juar* for fodder.
3 acres *bajra* for grain and dry fodder.

Rabi season (Cold weather)—
12 acres wheat
1 acre *senji* or other fodder crops

1373 (72) Adequacy of supply to increase in area—As a rule, areas under cotton or other crops

prefers *deshi* to exotics

Mr. Gul Mahomad Abdul Rahman called and examined

March and as there was general deficiency of water in the canals at that time, it was given up as a failure

climatic conditions were not suitable

1377. I carried out experiments with practically all the indigenous cotton that I could get, and found

1379. The largest area of American cotton on the Jamrao has been about 5,000 acres. The opinion of the Hon'ble Mr. Bhurgri, who is the chief cotton organiser on the Jamrao and has the largest area, appears to be in favour of American cotton provided there is water available for irrigation in the beginning of the season. He has indented for a large amount of seed. He sows a maund of seed on two to three acres. He indented for seed for 1,200 acres but we were only able to supply him with 300 maunds of 82 lbs. of seed. He thinks that, if the water supply at the beginning of *kharif* season is good, then the American cotton pays better than Sindhi.

1380. As regards the yield per acre, one *zamindar* obtained fifteen maunds on the Jamrao the year before last. It was obtained by Thakar Aidansingh in *deh* No. 243 Sanhro Minor, a distributary of the Jamrao. There is a good deal in the assertion that American cotton has not been given a fair trial but that is partly due to the tenant system because when the *zamindar* indents for seed, he has to distribute it among his tenants who are persons who cultivate. The cotton gets scattered in consequence and the seed is put in along side of *deshi*. When the two are picked, they necessarily get mixed up. The *zamindars* are not, as a rule, present at the time of picking and every thing is left to the tenants who do it as they like.

1381. As far as the Daulatpur Minor was concerned, where lands were given out on the condition that the *zamindars* should grow only such crops as were approved by the Agricultural Department, the *zamindars* purposely brought about the failure of American cotton in order to get the restrictions removed. They never weeded the crop. I remember to have shown a field of American cotton to Mr. Howard, when he visited Sind two years ago, where there was no trace of any crop but where weeds were growing. Side by side with it, Sind cotton was growing which had been weeded. I have no idea of the average yield of the 5,000 acres. In some places the crop failed owing to water difficulties and in some places owing to the land being saltish.

1382. *Deshi* sown in Sind yields about 20 to 25 per cent. more than American under given conditions. That figure is based on the figures available from the Mirpurkhas Farm and also from the seed farm and the cultivators' fields. The soil is not uniform. I have seen the figures for certain fields. I do not know whether they were selected fields or average ones but my impression was that from these fields the yield was from 20 to 25 per cent. more from local cotton than from American. The highest yield of American cotton obtained on the Mirpurkhas Farm was thirteen maunds. The highest yield of *deshi* since we started experimental work on the farm was seventeen maunds per acre. Mr. Bhurgri's opinion is that American cotton yields better than Sindhi. He probably cultivates his land better and the arrangement of his land is also better than that of many *zamindars* on the Jamrao. He thinks that American cotton does better on light soils than the *deshi*. He cultivates his land through *haris* but he supplies them with superior implements such as Egyptian ploughs, etc., as well as with iron ploughs and that they get more facilities than they get from other *zamindars* and their cultivation is therefore better.

1383. Inundation has been rather late during the past three or four years. Sometimes the water has risen in the canals as late as June so American cotton was not sown until the beginning of July. American cotton when sown late does not do so well as when it is sown in April because it suffers from dewfall.

1384. The sub-stations that we had were at Jacobabad and Kandhkote in Upper Sind Frontier District, Tharīri Muhabat and Dadu in Larkhana district, Khairpur Daharki and Shikarpur in Sukkur district, Hala, Tando Mahomedkhan and Badin in Hyderabad district, Daur, Nawabshah, Kandiaro and Naushahro in Nawabshah district. These were demonstration plots where we demonstrated American cotton and improved implements, especially some superior ploughs. The plots were worked by *haris*. In these places, when the inundation was early or normal the American cotton did well. At Nawabshah, Daur and Kandkote we got yields up to ten maunds. That was the highest. The sub stations have since been changed as follows: Shikarpur in Sukkur district, Khandkote in Upper Sind Frontier district, Nawabshah in Nawabshah district, Matli in Hyderabad district and Jamesabad in Thar and Parkar district.

1385. Under the present inundation canals, American has been rather unsatisfactory but if the inundation were early, then it might succeed on the inundation canals. Late inundation affects even *deshi* cotton, but when American cotton is sown late, *i.e.*, later than May, it gets affected by red leaf blight favoured by the dew falls which begin in September. It gets diseased and suffers in yield. If sown early, the crop is practically ready by then and thus yield is not affected by disease. American cotton should not be sown later than the middle of May. Even if there is water in inundation canals at the middle of May, the cultivators may not be ready for it and the land may not be prepared. The land should be ready beforehand so that as soon as the water comes, the seed can be sown. The land must be ready by the middle of May, and the American cotton must be in the ground immediately after that and then it will be a pretty safe crop. The yield of *deshi* cotton this year is very low; on the average it is about a maund an acre all over Sind, including the Jamrao tract, due to unfavourable season. I think *deshi* is hardier than American. If American had been sown on the Jamrao this year, the yield would have been less than a maund; because, owing to the closure of the Jamrao, the water in the canal came as late as June and the sowing of cotton was not over till the beginning of August. If American cotton had been sown at that time, it would have yielded nothing at all under prevalent district conditions. I have the figures of the seed farm at Mirpurkhas showing the yield of the pickings so far obtained. The highest yield has been 260¼ seers, *i.e.*, 6½ maunds from plot No. 9 of series No. 10. The variety grown was Triumph. The size of the plot was an acre and a half. The second best yield was 238½ seers from another plot of the same series, also an acre and a half in extent. If American cotton is sown on good land in May and is given good treatment and careful husbandry, the average yield in a normal season would be about eight maunds. On the same land, the average yield of Sindhi cotton would be about ten maunds. Under present conditions, I do not think American cotton can be said to be a safe crop on the inundation canals because they have not been given a satisfactory supply. The supply always comes late in June and the canals do not flow after September. The Jamrao has not been working satisfactorily during the last ten years. There is much dissatisfaction among the *zamindars* and there is a feeling of insecurity.

1386. The cultivation of berseem is a very good thing. There is some difficulty in getting the seed and the Agricultural Department has to import seed from Egypt every year. This year the cost has come to twice the normal, *i.e.*, Rs. 32 per maund which is beyond the reach of the ordinary cultivator. Green berseem is very popular and liked by almost all cultivators. There is a considerable demand for it at Sukkur and also at Mirpurkhas though at the latter place the demand for green fodder is limited. It is selling at six annas a maund. If we could get a supply of cheap seed, there would certainly be a demand for it everywhere for green fodder. It is more paying than wheat near towns. On Sukkur farm last year a plot of one acre yielded berseem worth about Rs 175 which was sold as green fodder. At Mirpurkhas and Sukkur, a one acre plot

were dissatis

beginning

eight months

are very harc

ment tour in

which we ha

spondingly There *is much scope for expansion* Our work is limited by the staff available. We were getting one graduate from Poona every year and sometimes two but this year the man has not come as he was kept in Poona for the dairy

them

Then the crop would

ll from the begin

When the water

for the preparation

twice as much as we are getting now only one half the area *would be cultivated* *It would not be more* than that because the land cannot stand intensive cultivation There would have to be rotation or the land would have to be left fallow There are no restorative crops grown at present I think that they

fall in the outturn We have not made any comparison between our land and that of the *zamindars* but I

amindars under the present system as

xperimental farm is very highly and

laimed Berseem does very well there

and some sugarcane The crops are

abnormal but even

Professor S C SHAHANI, M A, Vice Principal, D J Sind College, Karachi, and Zamindar, Jamrao

EXAMINED AT KARACHI JANUARY 21ST, 1918

Written statement

1 —AGRICULTURAL EXPERIENCE

(*a*) *Deshi short staple cotton*

from 1902 to 1917 I belong

ct

rown in the Jamrao tract

mrao tract vary from tw

the point I cannot give the

crops was at one time fixed

at one fifth of the whole, the [illegible] one-fifth of the total area [illegible] on this [illegible]

1396. (4) Yields and profits. [illegible] of [illegible]

1397. (5) Rotations and manures. [illegible]

1398. (6) Comparative returns. [illegible]

(a) [illegible]

(b) [illegible]

1399. (7) Conditions affecting increase in area. [illegible]

1400. (8) Uses of seed and seed selection. [illegible]

1401. (9) General economic conditions. [illegible]

1402. (21) Varieties. [illegible]

1403. (25) Conditions affecting increase in area. [illegible]

1404. (26) Suitability of existing varieties. [illegible]

1405. (27) Prevention of mixing of different varieties. [illegible]

1406. (28) Importation of seed. [illegible]

II.—Commercial [illegible]

1407. (30) Local trade centres. [illegible] future [illegible] Karachi [illegible]

1408. (32) Buying agencies. [illegible] cotton to the [illegible]

V.—General.

1409. (47) Effect of water rates. [illegible] the cultivators' [illegible]

1410. (48) Desirability of alteration in water rates.—[illegible]

1411. (49) Effect of tenure of land.—[illegible] will put the land into the hands of [illegible] cotton cultivation.

VI.—Irrigation.

1412. (66) Watering of cotton.—Cotton should be watered on hard clayey land every week and on soft sandy loam once every three weeks.

1413. (67) Cotton *versus* wheat.—The reason of the preference for wheat to cotton is less water required for wheat.

1414. (69) Wells and tube wells.—As a rule the sub-soil water in the tract is salt. I have no experience of tube wells. Wherever sub-soil water is sweet, tube wells will be a desideratum.

1415. (72) Adequacy of supply to increase in area.—Sufficient water is not available, and the water available is not properly distributed.

1416. (73) Desi *versus* American Cotton.—The cultivators prefer *deshi* cotton because under the existing conditions it yields better.

1417. (74) Effect of canal regulations.—The canal regulation create difficulties owing to water being not made available for irrigations in February each year.'

Professor S. C. Shahani called and examined.

1418. (*Mr. Henderson.*) I am Professor of English as well as Acting Principal of the D. J. Sind College. My own idea is that the cultivation of Egyptian cotton was a success and I think it would be successful if an adequate water supply in the month of February could be assured. I used to sow it in March. Water was wanted in February to prepare the land for sowing. The best yield was about eighteen maunds an acre. I

yield of Egyptian cotton was about six to seven maunds I grew both *Abassi* and *Mitafiff* I prefer the latter as it was hardier but the former was silkier and more handsome It was very difficult for us to sell Egyptian cotton as we had no market just as we now have no market for American. As a rule, it could not be sold for more than Rs 12 though sometimes it got up to Rs 14 whilst

ich is grown at the proper time is
ause the *bari* is not very keen on
it would go ahead I have seen
naund than for *deshi* I sold my
Rs 18 12 It was a small quan
ks to discontinue the cultivation
in March I sowed it before the
s cultivated very indifferently,
and so does not offer any standard for judgment Other things being equal *deshi* ripens in five months and does not suffer from dew American cotton also ripens in five months but it does suffer from dew If
... than is given by *deshi* American is always picked
ican which is first picked It is
bout the prospects of American
but one does not always get it
and the rest close their outlets
the minors The result is that
erican cotton.
bour conditions would improve
s when water supply was better
otton, I have been able to secure
an average of eighteen maunds ...
conditions were different Under present conditions even flow land has had to be converted into lift land If the intensity of cropping were higher
... place of fallows

rm than American cotton If
robably would be less affected
yptian cotton entire freely from

Mr T. F MAIN, B Sc, Deputy Director of Agriculture in Sind.

EXAMINED AT KARACHI, JANUARY 22ND, 1918

Written statement

I —AGRICULTURAL EXPERIENCE

... Deputy
tions but
xperience

of Sind extends over a period of some two years, but I served in this Province for eight months in 1906-07. The intervening period 1907—1915 was spent in the Presidency proper. I shall restrict my remarks to Sind where I am now serving.

1425. *Economic conditions of Sind.*—(i) *Land.*—There is no scarcity of land in Sind and the soil being alluvial is naturally good; sand areas exist but are not relatively extensive, but the presence of *kalar* salts renders large areas infertile or inferior. There is still plenty of good land and this will be perhaps the last of the economic features of the country to set a limit on increased cultivation.

(ii) *Irrigation facilities.*—For practical purposes, Sind is dependent upon canals for its water-supply as the rainfall is almost negligible. The canal system of Sind has grown rapidly in recent years, the annual increase of cultivated area averaging about 100,000 acres. In the absence of a barrage, however, the water-supply is most irregular and uncertain. The agriculture of Sind is subject to all the vagaries of the river; if it rises timely, then only a good agricultural year can be counted upon. Sometimes crops are sown only to wither owing to a temporary fall, while a premature termination to the inundation season leaves crops unmatured. All these occurrences are common experience and not the exception. For this reason, the area under cotton varies enormously, *e.g.*, the 1916-17 crop was thirty per cent. below normal in spite of war prices, while the sowing of the 1917-18 crop was likewise seriously delayed.

(iii) *Population and labour-supply.*—Owing to the increase of canal mileage and the improvement in the design of pre-existing canals, Sind has, in many respects, the character of a new undeveloped country with its attendant disadvantages as well as advantages. Until about a quarter of a century ago, the population was principally confined to the lands lying immediately adjacent to the Indus River, but with the construction of the Jamrao canal and other works, cultivation has spread further afield. These new areas have had to be colonized and are still largely underpopulated and greatly dependent upon a floating labour population from Marwar which ebbs and flows with the monsoon conditions of that country. This economic feature of the Jamrao tract is of great significance as it is the prototype of the eastern part of the great Triple Canal scheme associated with the Sukkur Barrage Project. It is therefore necessary to emphasise the inadequate supply of labour now and in the future.

(iv) *Agricultural holdings.*—Sind is a *zamindari* country and large holdings are the rule, but *zamindars* do not farm their lands as single units. On the contrary the tenant (or *hari*) system everywhere prevails, the landlord receiving a share of the produce. Good tenants for the colonized tracts are difficult to secure or keep, and this is one of the chief complaints so commonly heard on the Jamrao canal. The agriculture of the country in fact is carried on on small holdings, each tenant possessing one or two pairs of cattle and the standard of cultivation varies considerably. This is an important consideration in its bearing on the introduction of agricultural improvements; if, for example, a *zamindar* is supplied with seed sufficient for fifty acres it may be found on inspection sown on fifty distinct areas, each surrounded on all sides by the *deshi* variety.

(v) *Standard of agriculture.*—This is distinctly low and improvement is difficult in view of the *zamindar* not being the farmer himself. It is common to hear a *zamindar* remark that he quite approves of improved implements but his tenants object to them on the ground that their cattle are weak. These tenants are all poor illiterate men and financially dependent upon the *zamindar* for carrying on their business from year to year; they are not therefore in a position to lay out much capital on cattle and implements, with the result that the conditions of a high standard of agriculture, *viz.*, strong draught animals and efficient implements, are largely absent. Nor does the efficiency of the Sindhi labourer in any way compensate for these defects. In addition to the above, there are two distinct obstacles in the way of high class agriculture, *viz.*, the absence of manure and the lack of a good restorative crop as the people do not eat much *dhal*. In spite of these adverse conditions, the crops are by no means universally bad; on the contrary, good [illegible] seen, especially on the old non-colonized areas, where, however, the labour-supply is [illegible] mrao canal, a good crop can generally be ascribed to a long fallow rather than to any other cause.

1426. (2) **Varieties.**—In the first place, I may point out that cotton has never held a predominating position in Sind agriculture. Even now the cotton area in an average season is about 1½ lakhs of acres only, but the tendency in recent years has been strongly in an upward direction. There is only one *deshi* variety of commercial importance, *viz.*, a mixture of several types of *neglectum*, a short staple cotton showing with "Bengals" the lowest position on the Indian market. On the other hand, this cotton suits Sind admirably, being hardy, early maturing and prolific, capable of yielding up to twenty maunds per acre under very favourable conditions and commanding last year a rate of Rs. 10 per maund. For this reason, there is no dissatisfaction among the people with the *deshi* variety. It, in fact, enables cotton to take a primary place in the agriculture of those tracts where cotton is cultivated, and rice is only the crop which the people would care to substitute for it, which, however, is not practicable owing the limited water-supply.

1427. (3) **Size of holdings.**—A cultivator puts one-third to half or even more of his allotted area under cotton, but it is important to remember that only one-third of the occupied land on the Jamrao canal can be cropped in one year, so that if an area of eighteen squares be taken at random only two to three squares will be found cropped with cotton. The possibilities of increasing the cotton area are therefore two-fold: (1) by the introduction of canal irrigaion into tracts not at present served and (2) by increasing the supply of water in existing canal areas.

1428. (4) **Yields and profits.**—The profits of agriculture under the share system are somewhat complicated because of the double claim upon them, by the landlord and by the tenant. For emample, if a crop of cotton cost Rs. 25 per acre to produce and realized Rs. 50 (five maunds at Rs. 10) the profit would be Rs. 25, but the man who raised the crop would receive only Rs. 12½, which would leave little or no profit to him apart from his wages. The landlord, after deducting his minor contribution to the total expenditure would be left with some profit. The landlord's profit partakes of the nature of interest on capital invested in cotton land rather than in cotton while the tenants profit seems to be a more correct index of the profits of agriculture, in this case cotton. The tenant's profits are therefore a more important guide to the future prospects of any particular crop than are those of the landlord, but for general purposes the landlord's profits may be taken.

1429. (5) **Rotations and manures.**—It has been pointed out that there is no manure in Sind and no restorative crop. The former phenomenon arises out of the lack of any need for manure which has hitherto existed in Sind owing to the great surplus of land and the consequent faciliti for fallowing which serves the same purpose. When pressure on the land becomes greater, there will be more cattle and the people will take more care of it but this will not happen in the immediate future and an extension of cultivation

will tend to extensive rather than intensive methods As regards a restorative crop my predecessor Mr

1431 *History of exotic cotton in Sind* The history of the department s present effects to introduce

take on a very unhealthy appearance from August or September onwards This cotton has also lost some of

of the world As the province owing to financial reasons) has not been equipped with a botanist the more rational or scientific method of evolving a special cotton to suit the conditions of Sind by applying all the artifices known to the botanist profession has never been in force From this it follows that no

The method
h the Bombay
of adopting the
no doubt that

II —Commercial Aspect

III —Statistical

formula figures
er acre may equal

concerned

1434 (35) **Publication of Liverpool and Bombay prices** —I am strongly in favour of such a scheme but conversion to local terms would be necessary for cultivators to take full advantage of the information

General

1435 *Organization for handling cotton* —In para. 1431 above I have indicated the need of a botanist to do the best possible cotton for a given tract This work should not form

would in many provinces coincide with the best

ire for the multiplication and supply of pure seed
ariety has left the experimental station. Before

purposes.

(3) *The stage beyond the seed farm takes the variety outside the sole control of the Agricultural Department.* At this point it is necessary to devise some organisation which will admit of the extensive development of the new variety under some measure of Government control. This organization would include a district staff under the Deputy Director of Agriculture, each member of which would be given a unit area (say twenty villages) to operate in and his duties would consist of supervision and inspection as well as seed distribution. The seed would be supplied to selected cultivators who, by preference, should be registered as seed-growers for Government and subject to inspection. They would be under agreement as regards the disposal of the produce which would enable the department in the first instance to control the further distribution of the seed grown by them. Beyond this stage, *the department's executive duties could not proceed* and some form of co-operation would have to replace it. It should now be possible to form a group of registered seed-growers into a "ginning and seed-supply" co-operative society either owning its own gin or renting one, also owning a seed-farm and maintaining one or more trained agricultural overseers to watch *over the society's* interest by the inspection and supervision of the work of individual members. These overseers would in the *first place be lent from the department and subsequently transferred so that the withdrawal of the department would be gradual and the confidence of the public would imperceptibly pass over to the society as a* reliable and independent agency for the supply of good seed. The usual co-operative development would follow, such as the formation of unions, *which would facilitate the marketting of the ginned cotton to the* best advantage and the purchase of machinery on trade terms.

(4) The foregoing remarks assume that there will be a ready demand for seed of the variety in question. This may be so in the case of selected or improved *deshi* cotton but is not so probable in the case of an exotic against which all manner of prejudices arise. In order to break down such prejudices and to remove all obstacles in the way of the introduction of such a variety, the Agricultural Department must take suitable action. Such action might take the form of supplying seed at concession rates; compensation if loss is incurred but more important still, the establishment of a buying agency which would enable growers, without incurring grave inconvenience, to secure the proper rate for their produce. The type of buying agency which I would recommend has already been referred to in paragraph 1432 above, but where the trade are not inclined to co-operate in the establishment of such an agency then auction sales could be organized.

1436. (27) **Prevention of mixing of different varieties.**—As regards the field, the chief measure to be recommended to prevent the mixing of *deshi* cotton with an improved or exotic variety is the provision of a good buying agency for the supply of pure seed. In the early stages, such an agency must be in the hands of the department and the chief points to aim at are (i) the establishment of a sufficient number of distributing centres and (2) an abundant supply of seed so that a cultivator will not be tempted to fill up areas where seed has failed to germinate with any other variety more readily obtainable. In addition to this, so long as other varieties are largely grown, the inspection of the growing crop will be necessary so as to exclude the produce of mixed crops from reaching the gin intended for the pure variety. As regards the factory, I think the conclusions recently arrived at by the Punjab Government are sound, but the danger might be eliminated by the establishment of co-operation as indicated in [illegible] ve. The precaution originally taken at Mirpurkhas was to exclude all other cotton from [illegible] but this did not prove practicable, but would have done so had the American cotton been available in sufficient bulk.

1437. (28) **Importation of seed.**—This is a risky arrangement. As there is no certainty that a consignment of several tons of seed would prove botanically pure, there would probably be some admixture of other types than that desired which, in time, would affect both the crop in the field and the cotton in the mill. On grounds of expense also, this method should be avoided, if possible. It is, moreover, making rather a severe demand on nature to expect a cotton imported from America to maintain all its characteristics intact under totally new conditions.

VI.—IRRIGATION.

1438. (67) **Cotton** *versus* **wheat.**—Experience in Sind indicates that at the present time cotton is a more desirable crop than wheat in tracts suitable for cotton; the profits in a normal year for both crops are in favour of cotton, but this may not always be the case as wheat demands better tillage than it has hitherto received, while it is less exacting on casual labour. The main reason, however, why wheat is not such a desirable crop as cotton is because the *rabi* water-supply has proved so precarious.

1439. (69) **Wells and tube wells.**—I do not think there is much future f[illegible] canal irrigation with well irrigation in Sind for staple crops like cotton. The difference [illegible] well water and canal water is enormous and any cotton dependent upon supplementary well water would be grown under a crushing disadvantage as compared with cottons requiring canal water only. Moreover, there would be no security for capital invested as canal water subsequently made available would render a well obsolete. I am aware that such an arrangement does exist in some parts of India, but am under the impression that in such tracts cotton occupies only a small percentage of the cropped area. It is difficult to see how the economies of any particular tract would permit of this dual-type of irrigation. The manual and bullock labour required to work the wells would presumably be more than required during the period when canals are open.

1440 (71) **Cropping and causes affecting it.**—On the Jamrao canal in a normal year, the cropping distribution has been estimated at—

44 per cent. cotton.
20 „ other *kharif.*
36 „ *rabi* (mostly wheat),

(2) If the Sakkur Barrage scheme is carried out (which I am strongly in favour of), then these percentages might be expected to alter in favour of wheat for two reasons, (1) wheat cultivation at present is restrained by the scarcity and unreliability of the *rabi* water-supply and (2) *zamindars* are experiencing great difficulty in securing enough casual manual labour for weeding and picking cotton. At present a good supply of water at the beginning of the *kharif* season guarantees a large cotton area because *zamindars* are uncertain whether the *rabi* supply will or will not enable them to grow wheat. The growing of fodder crops does not at present exercise much influence on the cotton or wehat areas as the people are careless of their cattle and trust too much in the fodder requirements being met by the weed growth in their cotton fields and uncultivated areas. Nor do rotations much affect the issue for reasons already entered into.

Mr. T. F. MAIN called and examined.

1441. (*President.*) I have been in Sind for the last 2½ years. Before that I served for eight years in the Presidency proper. My headquarters were at Poona and I was working very largely in the cotton tracts

took over and he worked largely on the question of rotations and producing leguminous crops He introduced berseem from Egypt His principal experiments on the farm were in regard to rotations He had a two years' rotation and a three years rotation to see if he could get over the difficulty in Sind of having so much land fallow, *i e*, two or three years fallow to one year s crop I reviewed some of these experiments a

few years but the farm is too near the sea and it did not do well owing to the strong breezes

1445 At Nawabshah we have only got a plot in Nawabshah itself near the railway station which is worked by a *hari* It is very difficult to grow any crops in that tract owing to the great fluctuations in the river

f the canal On one side rice is grown and The common opinion is *wn it for a year or two*

and plots My general otton country only if we nce depends absolutely eem any reason why it to be worked out

1418 I do not find my circle so heavy as one in the Presidency but it is pretty heavy I tour for fifteen

Apart from this work, I am interested in wheat. Outside the barrage tract, the rest of Sind is largely a wheat tract. We have recently got money out of the wheat profits scheme which will enable us to take up work on wheat. Single handed as I am at present, I give most of my time to cotton. I try to avoid what I call fine work.

1449. I consider that a Deputy Director should not attempt to do very fine botanical work so that my efforts have been more or less of a rough character, just block selection, to see whether American cotton will generally do. There is justification for a botanist for cotton work in Sind. That has been our trouble; we have had to do our own botanical work. Neither of the Bombay Botanists does much cotton work. I do not think that a botanist should be permanently stationed in Sind to make investigations into the American cotton question. He should investigate the question, say for five or ten years, if necessary and then the Deputy Director should take it off his hands. The indications are that a great deal of careful work is necessary. Triumph suffers a good deal from disease. We want a research officer who could remain in the Province for some time.

1450. The question of forecasts is rather a difficult one. I do not think that the Agricultural Department can assist much in the compilation of forecasts because there is not a big [illegible] staff for the work. At present my fieldmen and I make general observations when we are on tour. T[illegible] to me and with the help of these reports and my own information, I write a very brief report and the Director of Agriculture refers to that but it is only for a rough check of the figures submitted by district officers that this report is made out. The officers of the Land Records Department deal only with areas.

1451. I have got one Divisional Superintendent, recently called Superintendent, and ten fieldmen who are graduates. The other fieldmen are merely local men picked up and trained. I am inclined to favour having our men trained in the Punjab because the conditions here approximate much more closely to those of the Punjab than to those of the Presidency Proper. My view, after having been both in Sind and in the Presidency, is that we can never recruit men from the Presidency for Sind as they do not like serving in Sind. The Punjabis have not the same objection. We send two men up to Poona every year and the same arrangements might be made with the Lyallpur College.

1452. I am against the importation of seed on a large scale as one does not know what one is getting. I would rather build up my own strains. I have recently been promised about 100 lbs. of pure Triumph seed from America. That is about just the amount which it is worth while bringing in in order to multiply here.

1453. Cotton is a favourite crop with the Sindhi where he can grow it. I think the Sindhi cultivator is quite as bad as he is made out to be.

1454. (*Mr. Henderson.*) The graduates from the Poona Agricultural College are well educated men but are not well equiped to face really practical problems. They are not quite all that we could desire. It is rather difficult to get rid of them once we have got them. I would not go in for getting rid of too many but would get rid of a small percentage. We must make the best of what we have got. I do not think the Poona training is ideal for Sind. There is too much college work as opposed to farming. Once or twice I have recommended a man for training at Poona but the Commissioner very frequently selects a man on his own initiative. I have never been back to Poona since I left it. I think it would be a good thing if the Deputy Directors were kept in touch with the training of the men at Poona. The conditions in Sind are very hard from the point of view of climate. It is a particularly malarious country. In the Punjab, the Deputy Directors get two months' hill leave: there is no hill leave attached to Sind. I certainly think two months hill leave should be given in Sind. I should prefer to send men from Sind to Lyallpur rather than to Poona.

1455. As regards intesive cultivation, I think fifty per cent. is the maximum limit you could work up to. We could work the ryots up to one fallow in two years of cultivation. That is my opinion as regards a new project. There is no chance of working considerably beyond that figure for the next generation or perhaps two. Under intensive cropping with rotations, the crops would be rather smaller than the crops that would be produced after a two or three years' fallow. I do not think that the system of rotations has had a fair trial because the *rabi* water supply is very uncertain.

1456. The system at Mirpurkhas involves the cultivation of berseem. There is now great future for berseem for some considerable time to come. The demand for it has been limited. The stumbling block is the price of the seed. The price of berseem is six annas a *maund* delivered at Mirpurkhas. If grown on a large scale, the price of green berseem is very small. It is a question of demand and supply. There will be a greater demand for berseem when more land is taken up for irrigation. I am rather inclined to favour the view that berseem should be fed on the land rather than exported. It would be perhaps the best arrangement to do both, *i.e.*, to export some and to feed some. That might bring about a great increase of stock and might lead to an increase in sheep industry. We have yet to prove that the people will take up berseem growing on a large scale. If they have to pay a high price for their seed it is doubtful whether they will do so. Under existing conditions it would not be safe to estimate on a large area of berseem. The yield of seed over large areas does not exceed a maund an acre but on small areas we have got up to three maunds. Taking a crop of seed means sacrificing a very good cutting—perhaps worth Rs. 50, and if the cultivator only gets one maund of seed in exchange, that is not paying proposition. If he got three maunds, that ought to satisfy him but if the price of seed went down, he would not take it, but would rather sell the green berseem. It is rather a slow business thrashing berseem. I am not in favour of allowing a large area for berseem on new canals—not for the first thirty years.

1457. The Jamrao canal is designed for one-third of the area to be cultivated. I think the proportion could be reduced to one-half. The main crops are cotton and wheat, which is undoubtedly an exhaustive combination. Irrigated wheat grown continuously went down to 300 lbs. an acre after about four or five seasons. We grew wheat on the Mirpurkhas experimental farm last year after constant wheat growing with the above result. On the seed farm, the crop was watered only once after it was sown; the normal number of waterings is four. That was on the seed farm on a fairly big scale. We had about sixty acres of wheat last year. The wheat was Pussa No. 12 and the yield was 16½ maunds per acre. On a few plots we tried the effect of growing it without watering at all after sowing. We got fairly good results but not as good as those obtained by one watering. I am inclined to think that two waterings would give the best results. It is difficult to carry out experiments owing to the unequal distribution of *kalar* soils. It is rather difficult to generalise on these results except that the area included a very large portion of stiffish soil.

1458. The last date for sowing Triumph is usually the end of May but it can be sown later. This year all our Triumph was sown in June. I do not think there is much difference in the length of the *deshi* and American cotton seasons. I should certainly say that American is not longer in maturing than *deshi*. Sow-

iple, in
selec
undred
I am
ype of
ning, I
rt now
I had
om the
think,
re, it is
certainly pure

1460 If the Jamrao fails again as it did last year, then American cotton will have no future I think it is only worth while working with this American cotton on the assumption that the barrage scheme is going to be pushed through I do not see any prospect of American cotton on the inundation canals They are

tion in size of the bolls of Triumph was

the two work should not go on together I have to a certain ex

not likely to grow berseem as long as they get just enough There is no prospect for a crop great deal more water than any other *rabi* crop

take the view that if land is kept fallow, the cultivation charges are increased. I take the opposite view and I think it is the other way round. What happened on the seed farm this year was that a certain area was cultivated: there was weed growth and some of the weeds could not be removed until they had seeded. Now if a crop were taken on such land in Sind the following year, the weeds would grow again. My experience of continuous irrigaton is that weeds become more difficult to control than they do on land that gets starved of water. The cost of weeding cotton in Sind is very heavy. It is perhaps the most formidable item in the cultivation charges. It is essential but hand weeding is very expensive. It costs Rs. 6 or Rs. 8 in the season. The cultivator would not do it more than twice and many only once. Intercultivation is not known in Sind. They do not even run the plough through. One of my lines of work is to introduce line sowing and I am still trying to discover the best way to do it. It implies drilling and that implies previous cultivation which the Sindhi cultivator knows nothing about. I have been trying some of the Presidency drills. I am in favour of the following in existing conditions under which leguminous crops and manure are non-existent. It would be more convenient to concentrate labour on a smaller area and to crop it more intensely. In countries where there is more land than there are people, the type of agriculture is extensive and not intensive. I think the number of cattle must be measured by the amount of water available for cultivation. Upper Sind, which is the best cattle breeding tract, will continue to breed cattle. I do not say that the cattle will be sufficient for the whole of Sind but at present a large number of cattle came from Upper Sind. The cattle are weak which is largely due to feeding under the present conditions. No fodder crops are grown for them. I do not think that that is entirely due to the system of extensive cultivation.

1465. (*Mr. Wadia.*) Some years ago, about 1911, Mr. Keatinge prepared a note in which he stated what the Department had done for cotton, the stage it had got to and the difficulties.* The chief difficulty that he particularly brought out was the marketing of improved strains. He circulated this note to the Chambers of Commerce and he sent it home to Manchester and the result was that Manchester moved very quickly and went to the Secretary of State. A proposal was set going that the British Cotton Growing Association should establish some form of buying agency in Sind to buy up to the American cotton. The Bombay Cotton Trade Association also moved in the matter and Government thought it reasonable to support the proposals of the Bombay Trade rather than those of Manchester. As a result, a Syndicate was formed in Bombay to establish two buying agencies in Sind. Several conditions were laid down, the Syndicate put up its gins and the Department distributed the seed. The cotton however did not come in and that was why the whole thing broke down. The Syndicate wanted the Government to stand half the loss. I was not in Sind at the time. The Shikarpur factory never worked and it had to be given up; the machinery had to be sent to Bombay to be resold and the building was taken over by Government at half price. The settling up of the Shikarpur business took place in my time. This year, the Mirpurkhas factory was closed because there was no cotton. At the same time the Mirpurkhas factory can work on *deshi* cotton. It did so last year. The arrangement was that when the cultivator delivered his cotton he was to get the Liverpool price less expenses. He was to get half the amount as an advance and the balance due to him was to be worked out later. It was very difficult to make the cultivator understand that. He was accustomed to getting his money at once for his cotton. So the arrangement had to be altered. The present proposal which is one of the chief conditions on which the Syndicate has been re-organised is, that the price should be really the intrinsic value of the cotton, regardless of the small amount. Although last year was a great improvement on previous years, this was not quite realized. The premium was Rs. 2-5-6 and that was not quite the proper premium. The cotton was picked as well as one could expect in Sind and I do not think it was much mixed. It was not more leafy than normal. If saw ginned cotton were sent to Liverpool, it would give the intrinsic price but to send roller ginned cotton to Liverpool was to court disaster. Therefore Government advocated saw gins. My opinion is quite the reverse. I think the cotton last year was leafy but not more leafy than one gets in Sind. I do not know why the leaf could not be got out; there was not more leaf in it than in *deshi*. The crop was about 500 bales. The crop of American in 1914-15, was not all grown on the farm. Some of it was grown on the Jamrao Canal by *zamindars*. The crop averaged between 500 and 600 bales for two or three years. There was practically nothing from the farm. The farm is only 200 acres and half of that would be under cotton. The farm produced about thirty to forty bales; the rest were produced by the cultivators. The year that I am speaking of is they are in which the Syndicate did not operate. The Syndicate operated last year it was the year before that that we produced forty bales from our own land. Thirty bales were sent to Cawnpore, and ten bales were sent to Nagpur. I understand that last year the Syndicate got all the cotton. The management of the Syndicate has been taken over by Messrs. Tatas and is much better. One of the conditions is that the cultivator should be paid when he delivers his cotton. It is the business of the Syndicate to arrange to get the Liverpool valuation; we can only check the results. The Syndicate must be guided by the judgment of the men sent out to buy. One of the difficulties is that Bombay is now insisting on roller ginned cotton. That means that some one must take less money. I had one sample of saw ginned American Triumph cotton sent down to Bombay this year (1917 crop) and it was valued at Rs. 525 per *khandi* against Rs. 475 taken as the standard of the comparison by the Bombay Cotton Trade Association for M.G. Sind American which shows Rs. 50 per *khandi* in favour of saw ginned cotton. The cultivators have to stand the loss Bombay values the roller ginned cotton at Rs. 50 more than the saw ginned but won't take it. The first pickings are very good and so are the second and third but you will always find that at the end of the season the pickings are inferior.

1466. The licensing of ginneries would act as a check on mixing but, I think, that the conditions would have to be easier than that the license should be withdrawn if cotton were mixed. Regulations might be made by which valuable cotton would not get mixed up with the *deshi* types, on conditions of the withdrawal of license. I think action would have to be taken very carefully. An example might be made.

1467. (*Mr. Hodgkinson*). According to the British Cotton Growing Association, the saw ginned sample of Triumph measured $1\frac{1}{8}$ inch and the roller ginned sample $1\frac{1}{16}$ inch. I have copies of that correspondence. According to their valuation, the saw ginned cotton had a longer stapled cotton than roller ginned.

1468. (*President.*) I do not think there is much scope for exotics in the Presidency.

1469. (*Mr. Wadia.*) I know something about *goghari* cotton. It apparently came from the Jambusar Taluk in the northern part of the Broach district. It is botanically the same cotton as Broach or Surat but it has an agricultural difference; it has a higher ginning percentage. There is more of it mixed in the cotton round about Surat than there used to be. I think the staple is $\frac{1}{8}$th inch shorter than Broach. I have found fifty per cent. mixture of *goghari* in Broach now. It will bring down the quality of Broach. If it go

down to Navsari, it would seriously affect the Navsari cotton. It will not be in the interest of the trade to have this cotton growing side by side with Navsari cotton It is spreading south of the Narbada. I should be inclined to keep it north of the Narbada if possible but there is at present no machinery for doing so

---

Mr. G. E. CHATFIELD, I.C S , Collector of Ahmadabad and formerly Colonization Officer, Sind.

EXAMINED AT AHMADABAD, FEBRUARY 9TH, 1918

Written statement

I —AGRICULTURAL EXPERIENCE

[illegible]

they command

[illegible] These flow for a period which differs considerably from year to [illegible] canal is supposed to have a supply [illegible] imagined where there is such scanty [illegible] No careful cultivation pays. The one idea of the cultivator is to break up as large a surface as possible when the water rises, sow his crop and trust to luck. The land is left full of bushes and trees, manuring and weeding are rare and a rotation of crops absolutely unbrought of The aim in fact is to cultivate in the roughest manner the largest possible area of fresh land every year

[illegible]

shoddy imitation wools.

(3) There cannot be said to be distinct varieties of Sindhi cotton though it differs in quality in different parts of the country The best is that grown at Bhitshah in the Hyderabad District, the worst is that grown on the Jamrao Canal

[illegible] water in [illegible] maintain a [illegible] inundation [illegible] is generally [illegible] only canal [illegible] nt level of [illegible] on a large scale with any degree of success [illegible]

varies in accordance with the nature of the inundation. One may say that evey man will put as much as he dares under cotton; and, given sufficient water, would grow nothing else except a little *bajra* for food and fodder. Owing to the custom of sowing many different crops in the same survey number, the information on this point is bound to be inaccurate, being based upon rough guess work.

(3) On the Jamrao and Mithrao Canals, information is far more definite, inasmuch as this custom does not prevail there (there is a separate and higher rate of assessment on cotton than on other dry crops). The Jamrao Canal is supposed to supply sufficient water to irrigate one-third of the occupied land commanded by it. In practice, *zamindars* cultivate rather more than this—say, forty per cent. The Punjab peasant colonists, who are good cultivators, and whose lands are favourably situated, commonly cultivate fifty per cent. annually. The proportion under cotton varies in different parts of the tract. It is highest in the purely Sindhi villages. The Punjabi has brought with him from his land his affection for wheat and does not therefore go in for cotton to the same extent. On an average, however, cotton is about 45 per cent. of a *zamindar's* cultivation, wheat 35 per cent and other crops twenty per cent. Supposing a *zamindar* to own forty acres, he would commonly have eighteen acres under cotton, fourteen under wheat and eight under *bajra* and other crops.

(5) As regards the relative merits of large or small holdings, I would remark that amongst Sindhis, whose *methods are generally bad, the best cultivation is generally found in large estates.* The big *zamindar* is most likely to be enlightened and to have sufficient influence with his cultivators to insist upon a certain standard being maintained. Amongst the Punjabi colonists, on the other hand, the peasant proprietor cultivates his land far the best. The Punjabi yeoman and capitalist, who gets his land cultivated for him by others, is handicapped by the dearth of labour and is in no better position than a Sindhi *zamindar*.

1475. (4) **Yields and profits.**—The yield fluctuates enormously with the nature of the season and inundation. A good crop of cotton on the inundation canals might, however, be expected to yield ten maunds (of 80 lbs.) per acre. On the Jamrao, where the land is cropped more frequently and the cultivation is worse than elsewhere, the outturn is lower—I should say that a good Jamrao crop brings in eight maunds per acre. The *zamindar* takes one half of the produce in flow land and one-third in lift land (and two-fifths when the flow irrigation is supplemented by lift). The prices of cotton vary so enormously that it is difficult to estimate the profit. In 1904, six rupees per maund of seed cotton was a fair price. The price has since risen to Rs. 10 and Rs. 12, and is liable to continual fluctuation. Taking Rs. 10 as a fair average price now-a-days, a good crop on the Jamrao must bring in the owner Rs. 80. If the land is flow, the owner takes Rs. 40; if lift Rs. 26-10; if betwixt and between, Rs. 32. From this must be deducted the consolidated assessment and water rate (maximum Rs. 4, minimum Rs. 2-14) and the expenses of keeping up the boundary marks and bunds." The net profits on a good crop must be considerable.

1476. (5) **Rotations and manures.**—Manures is rarely used. The commonest form of manure (so-called) is the silt cleared from the beds of water-courses. The earth from old village sites is also used with good results. Farm-yard manure is very seldom used except for tobacco and sugarcane. I do not remember seeing cotton so manured. It must, however, be remembered that the Indus water contains a very large proportion of silt, especially in the inundation, and if this can be got on to the land and not dropped in the water-course, it acts as a natural manure.

(2) Rotations are not understood or followed. This is chiefly due to the fact that the water-supply is insufficient for the area commanded. The Sindhi has been brought up to rely entirely on fallows to re-invigorate the soil. Even the Punjabi rings the changes on cotton and wheat with an occasional turn of oilseed or millet. No leguminous crop is grown. The Agricultural Department has for many years endeavoured to introduce berseem, but the crop has not proved as success. It grows well but there is not a sufficient market for it and there is a difficulty in obtaining seed for distribution.

1477. *Comparison of Sindhi with exotic cottons.*—After many years' experience of the attempt to popullarize exotic cottons in Sind, I am of opinion that it has not been a success. Egyptian and American cottons can be grown with excellent results, and it is not difficult to induce *zamindars* to grow them in limited areas. Some educated *zamindars* have even shown enthusiasm over the experiment and put large areas under cotton, but the bulk of the *zamindar* class is indifferent and would not touch exotic cotton except under official pressure or encouragement.

(2) I have no personal experience of the matter later than 1907, since in 1914, when I returned to the Jamrao as Collector, the cotton market collapsed owing to the war and all attempts t[illegible] cottons were temporarily abandoned. But I have met and talked with *zamindars* on the [illegible] and American cotton; and, of course, I had considerable experience of the difficulties involved when I was Colonization Officer from 1903 to 1907.

1478. *Causes of failure of Egyptian cotton.*—Egyptian cotton failed definitely for several reasons. In the first place, it required more care than could be expected from Sindhi cultivators. Secondly, the method of sowing (on ridges) rendered it liable to attack by white ants. Such at least was the popular belief, which I shared. Thirdly, it suffered terribly from boll-worm. Fourthly, it is an eight months' crop and the last pickings are liable to be cut off by frost in the months of December and January. I do not think that Egyptian cotton will succeed in Sind until the standard of cultivation has risen immensely; and until the management of perennial canals has so far improved as to allow cotton to be sown on a large scale as early as March. Egyptian cotton sown in June will always be likely to suffer in December and January from frost.

1479. *Difficulties in the way of the extension of American cotton.*—American cotton has, I understand, done well on the Jamrao though I have not seen it grown on a large scale by the *zamindar*. It is pity that the war brought the experiment to an end The chief difficulties with which it has to contend are as follows:—

(1) Bad *agricultural* methods, due to the traditions brought from the inundation tracts, the scarcity of labour and consequent inability of the *zamindar* to exact good work from his cultivators; and finally the sheer laziness of the Sindhi, content with a low standard of living and sure of obtaining work and maintenance. Everything new demands more trouble and the Sindhi does not like to take trouble.

(2) The enormous prices paid for the indigenous Sindhi cotton. In 1906-07, a maund of Sindhi cotton would perhaps fetch Rs. 6-8-0 or Rs. 7, while a maund of Egyptian cotton would fetch Rs. 13 or Rs. 14 at the auctions, which I used to hold at Mirpurkhas. These auctions were discontinued later, as was inevitable. When the price of indigenous cotton rose to Rs. 11 or Rs. 12 per maund, the inducement to grow exotic cotton was diminished. American cotton had been substituted for Egyptian and the cultivator only received a rupee or two above the price of ordinary cotton for what had cost him more trouble to grow.

(3) Difficulty of disposing of exotic cotton In 1906 07 and 1907 08, this was done at auctions held by the Colonization Officer and the arangement was satisfactory to the cultivator But this

(I T

consideration is the most convenient season for the purpose The particular reasons for which *it is des rable that cotton should be sown as early as possible are (a) because tl e crop is* ... autumn and ... the cultiva ... at when the ... interests of the cotton

(6) The southern portion of the Jamrao tract which is more fertile than the northern is also more liable to suffer from fogs in the autumn—a condition favourable to the spread of boll worm I think that the lands in tl e Hyderabad and Na vabshah Districts will be superior cotton growing areas when provided with perennial irrigation This scheme is already under cons deration

1480 (26) Suitability of existing varieties —The American upland cotton has been proved by experience to be the most suitable for Sind For reasons already stated I consider that Egypt an cotton has no real

mindar if he crop is nage from overnment te to the ial canals ide there e the area idden) are y unskilful methods of cultivation As the area under perennial irrigation is increased and the population *increases* of rice no good crop can The people assert that the

Mr G E CHATFIELD, I C S called and examined

September, October and November and the people are considerably weakened by it. I do not think tha this prevents outside people coming in and settling there.

1505. It would be an advantage from the economic point of view if the system of extensive fallow were modified and the land were more intensively cultivated. From the agricultural point of view, as I have said, there would be confusion at first until the people got accustomed to it. I do not think that if the land was more intensively cultivated salt efflorescence would increase. All the high land tends to become salt as it is cultivated last. The most intensive cultivation on the Jamrao is in the Punjabi villages where it is fifty per cent. In the lift land round Sukkur it is even greater: also in most rice tracts.

1506. (*Mr. Roberts.*) There is a great deal of fever in the rice tracts. Experience shows that settle conditions on perennial canals do not tend to diminish fever. Mirpurkhas used to have the name of bein a very healthy place before the Jamrao was opened but now it is regarded as a fever stricken spot. At th same time the worst part of the Jamrao tract is not so bad as a rice tract like Badin.

1507. (*President.*) I do not think that the Agricultural Department can do much on the inundati canals near Hyderabad where the conditions are so very rough. I do not think there is anything very mu to be done. It can only be of use on a canal like the Jamrao. I think the present staff of the Departm is sufficient for existing work. I do not know the whole of Sind. The barrage would change things make a much larger staff necessary.

Mr. S. N. DAMALA, Agent, Messrs. Ralli Brothers, Mirpurkhas, Sind.

THIS WITNESS WAS NOT ORALLY EXAMINED.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

(a) "Deshi" short-staple cotton.

1508. (1) **Experience.**—I have been stationed in the cotton growing districts of Sind for eleven years, *viz.*, one year at Tando Adam and ten years at Mirpurkhas. I also have been stationed for about ten years at Lyallpur, Multan, Ludhiana, Raewind, Changa Manga, Ferozepore, Hansi, etc. I have been in touch with the cotton cultivators in Sind, but not with those of Punjab, owing to my frequent transfer from place to place.

1509. (2) **Varieties.**—There is practically only one variety of *deshi* short-staple cotton grown in Sind, with the exception of the *Shah-ko-bit* rougher variety grown at Shakabit (thirteen miles from Tando Adam) and at Kotlaloo (25 miles from Nawabshah). This variety gives nearly sixteen seers of lint per maund of 41 seers against thirteen to fourteen seers of the ordinary variety. It is rougher thar ordinary Sind, but the production hardly exceeds one per cent. of the whole crop of cotton.

1510. (3) **Size of holdings.**—The size of holdings varies from ten to twenty acres up to thousands of acre One-third of the holding is supposed to be cultivated every year, but, owing to scarcity of water ar labour, I doubt if actually more than one-fifth is cultivated.

(2) Out of the area cultivated on the perennial canals in Sind, I estimate the cotton crop to represe fifty per cent., the remainder being thirty per cent. wheat and twenty per cent. fodder crops.

(3) On the inundation canals, the area sown with cotton represents a larger proportion, as there is water for *rabi*. I estimate this proportion at seventy per cent., the other thirty per cent. being fodder cro

(4) There are lands, especially on the old Sind canals (lift irrigation lands) of exceptional fertility, yi ing up to twenty maunds of *phutties* (unginned cotton) per acre with ordinary cultivation (*viz.*, ploughings, one weeding and seven to eight waterings) and other lands, especially on the Jamrao t yielding hardly 3½ to 4 maunds per acre, with the same system of cultivation, etc.

1511. (4) **Yields and profits.**—The profits of the cultivators, it is very difficult to estimate, but rou taking the expenses of the cultivation (labour, seed, weeding, cattle, revenue, etc.) at Rs. 20, the yi five maunds and the average rate of *phutties* at Rs. 9 per maund of 40 seers, the profit will be Rs. 25 pe *viz.*, 5 × 9=45—20 =25.

1512. (5) **Rotations and manures.**—No scientific rotations, as understood in other countries, f are followed in Sind. Usually cotton is succeeded by one to three years fal enrichment of the soil, then the same land is sown with wheat, *juar*, *bajra*, etc., all exhausting crops. Leguminous crops *chowla* (beans), gram, *mung*, *moth*, *guar*, which improve the soil are cultivated on an insignificant s

(2) The only manure, applied to the land, is cow and goats' dung from the few animals in the p of each cultivator but most of the cow dung is used as fuel. Near the towns, some of the cultiva occasionally cow and goats' dung, also sweepings, but the areas so manured are inconsiderable.

1513. (6) **Comparative returns.**—As above stated, there is practically only one variety of sh *deshi* cotton in this district. Exotic cottons have been tried during the last twelve years in thi Sind, *viz.*, the Egyptian (white=Abassi and yellow=Metaffiffi). This cotton has been very un It was attacked by bollworm and, if I am not mistaken, had suffered from scarcity of wate alkali in the soil. The American *Triumph* variety has been tried during the last two seasons. per acre was, I think, 25 per cent. less than that of *deshi*. The second year the stuff was rathe admixed with *deshi* cotton, the seed distributed the second year being admixed with *deshi* seec

1514. (7) **Conditions affecting increase in area.**—There is some fluctuation in the area *deshi* cotton due to lower or higher rates. If in a previous season, the rates of cotton are hig sow more cotton during the ensuing season and *vice versa*. The same is done for wheat.

1515. (8) **Uses of seed and seed selection.**—The seed is partly despatched to Karach from India or in order to be sold locally at Karachi to native speculators and partly is sold loca to native speculators, who export it to Karachi, Marwar or Punjab for feeding cattle, or sell it same purpose. There are no cotton oil mills in Sind.

(2) Hand ginning has died out in Sind, consequently hand ginned seed for sowing is not available Ten
tive
were
oint
ries
to

Rs [illegible] per maund

(c) *Exotic cotton*

1516 (21) **Varieties.**—No exotic cotton is growing in Sind

1517. (25) **Conditions affecting increase in area**—Length of [illegible]
competitions of fo
mentioned in the
any appreciable e
will affect the exo
unfavourable winds, etc

1518 (26) **Suitabilities of existing varieties.**—The Triumph American variety was a good one [illegible]

year, instead of
the cultivators
e introduction of

American cotton by making some sacrifice, viz, to import every year American seed and give it to the cultivators at the average rate of *deshi* seed, viz, for about Rs 2 8 0 per maund of forty seers instead of selling it at Rs. 5 to 6 per maund

II.—Commercial Aspect

[illegible]
is delivered during the ensuing season. Messrs Ralli Brothers buy by contract before or after the crop begins to come in but make no advances

1522. (31) **Standardization of commercial names**—There are no special names for the Sindhi *deshi* cotton, excepting the unimportant variety of *S a i Lo bhit* mentioned above

1523. (32) **Buying agencies**—The existing form of buying is the best

III.—Statistical.

1524 (33) **Improvement of cotton forecast**—The Government cotton forecast have so far turned out rather incorrect Messrs. Ralli Brothers' forecast are in my opinion more correct I cannot suggest any way in which it could be improved, but I think that the Revenue the Agricultural and the Irrigation Departments ought to be more in touch with the cultivators and know what is going on

1525 (35) **Publication of Liverpool and Bombay prices**—It would be a good thing to publish daily the Liverpool and Bombay cotton prices at up country markets to enable the cultivators to follow the course of the market, instead of being mostly in the dark, as is at present the case with them

IV.—Manufacture

(a) *Ginning and Pressing*

[illegible] Factory at Mirpurkhas
There is also a cotton

22½×22½×26 inches up to 22½×22½×32 inches	Shipping measurement 20 up to 25 tons per 100 bales

1528 (38) Saw gins *versus* roller gins—Ordinarily saw gins are not suitable for *deshi* cotton. They [illegible]

September, October and November and the people are considerably weakened by it. I do not think that this prevents outside people coming in and settling there.

1505. It would be an advantage from the economic point of view if the system of extensive fallow were modified and the land were more intensively cultivated. From the agricultural point of view, as I have said, there would be confusion at first until the people got accustomed to it. I do not think that if the land was more intensively cultivated salt efflorescence would increase. All the high land tends to become salt as it is cultivated last. The most intensive cultivation on the Jamrao is in the Punjabi villages where it is fifty per cent. In the lift land round Sukkur it is even greater: also in most rice tracts.

1506. (*Mr. Roberts.*) There is a great deal of fever in the rice tracts. Experience shows that settled conditions on perennial canals do not tend to diminish fever. Mirpurkhas used to have the name of being a very healthy place before the Jamrao was opened but now it is regarded as a fever stricken spot. At the same time the worst part of the Jamrao tract is not so bad as a rice tract like Badin.

1507. (*President.*) I do not think that the Agricultural Department can do much on the inundation canals near Hyderabad where the conditions are so very rough. I do not think there is anything very much to be done. It can only be of use on a canal like the Jamrao. I think the present staff of the Department is sufficient for existing work. I do not know the whole of Sind. The barrage would change things and make a much larger staff necessary.

Mr. S. N. DAMALA, Agent, Messrs. Ralli Brothers, Mirpurkhas, Sin

THIS WITNESS WAS NOT ORALLY EXAMINED.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

(a) "Deshi" short-staple cotton.

1508. (1) **Experience.**—I have been stationed in the cotton growing districts of Sind for eleven years, *viz.*, one year at Tando Adam and ten years at Mirpurkhas. I also have been stationed for about ten years at Lyallpur, Multan, Ludhiana, Raewind, Changa Manga, Ferozepore, Hansi, etc. I have been in touch with the cotton cultivators in Sind, but not with those of Punjab, owing to my frequent transfer from place to place.

1509. (2) **Varieties.**—There is practically only one variety of *deshi* short-staple cotton grown in Sind, with the exception of the *Shah-ko-bit* rougher variety grown at Shakabit (thirteen miles from Tando Adam) and at Kotlaloo (25 miles from Nawabshah). This variety gives nearly sixteen seers of lint per maund of 41 seers against thirteen to fourteen seers of the ordinary variety. It is rougher than ordinary Sind, but the production hardly exceeds one per cent. of the whole crop of cotton.

1510. (3) **Size of holdings.**—The size of holdings varies from ten to twenty acres up to thousands of acres. One-third of the holding is supposed to be cultivated every year, but, owing to scarcity of water and labour, I doubt if actually more than one-fifth is cultivated.

(2) Out of the area cultivated on the perennial canals in Sind, I estimate the cotton crop to represent fifty per cent., the remainder being thirty per cent. wheat and twenty per cent. fodder crops.

(3) On the inundation canals, the area sown with cotton represents a larger proportion, as there is no water for *rabi*. I estimate this proportion at seventy per cent., the other thirty per cent. being fodder crops.

(4) There are lands, especially on the old Sind canals (lift irrigation lands) of exceptional fertility, yielding up to twenty maunds of *phutties* (unginned cotton) per acre with ordinary cultivation (*viz.*, two ploughings, one weeding and seven to eight waterings) and other lands, especially on the Jamrao track, yielding hardly 3½ to 4 maunds per acre, with the same system of cultivation, etc.

1511. (4) **Yields and profits.**—The profits of the cultivators, it is very difficult to estimate, but roughly, taking the expenses of the cultivation (labour, seed, weeding, cattle, revenue, etc.) at Rs. 20, the yield at five maunds and the average rate of *phutties* at Rs. 9 per maund of 40 seers, the profit will be Rs. 25 per acre, *viz.*, $5 \times 9 = 45 - 20 = 25$.

1512. (5) **Rotations and manures.**—No scientific rotations, as understood in other countries, for the enrichment of the soil, are followed in Sind. Usually cotton is succeeded by one to three years fallow and then the same land is sown with wheat, *juar*, *bajra*, etc., all exhausting crops. Leguminous crops such as *chowla* (beans), gram, *mung*, *moth*, *gwar*, which improve the soil are cultivated on an insignificant scale.

(2) The only manure, applied to the land, is cow and goats' dung from the few animals in the possession of each cultivator but most of the cow dung is used as fuel. Near the towns, so[illegible] buy occasionally cow and goats' dung, also sweepings, but the areas so manured are [illegible]

1513. (6) **Comparative returns.**—As above stated, there is practically only one variety of short staple *deshi* cotton in this district. Exotic cottons have been tried during the last twelve years in this part of Sind, *viz.*, the Egyptian (white=Abassi and yellow=Metaffiffi). This cotton has been very unfortunate. It was attacked by bollworm and, if I am not mistaken, had suffered from scarcity of water and from alkali in the soil. The American *Triumph* variety has been tried during the last two seasons. The yield per acre was, I think, 25 per cent. less than that of *deshi*. The second year the stuff was rather too much admixed with *deshi* cotton, the seed distributed the second year being admixed with *deshi* seed.

1514. (7) **Conditions affecting increase in area.**—There is some fluctuation in the area sown with *deshi* cotton due to lower or higher rates. If in a previous season, the rates of cotton are high, cultivators sow more cotton during the ensuing season and *vice versâ*. The same is done for wheat.

1515. (8) **Uses of seed and seed selection.**—The seed is partly despatched to Karachi for export from India or in order to be sold locally at Karachi to native speculators and partly is sold locally up-country to native speculators, who export it to Karachi, Marwar or Punjab for feeding cattle, or sell it in Sind for the same purpose. There are no cotton oil mills in Sind.

Ten tive vere omt ries l to Rs 2 per maund

(c) *Exoti c cotton*

only this irregular t alkali soil bollworm

was a good one

at Rs 5 to 6 per maund

II —COMMERCIAL ASPECT

1521 **(30) Local trade customs** —Factory owners and merchants advance to the cultivators Rs 2 p r maund and buy the p ally they advance the tot at the time of buying ime is delivered during t rop begins to come in but make no advances

152? **(31) Standardization of commercial names** —There are no spe ial nam s for the Sindhi *deshi* cotton excepting the unimportant variety of *S a ko bhit* mentioned above

1523 **(32) Buying agencies** —*The existing form of buying is the best*

III —STATISTICAL

turned ou gest any way it on D part ments ought to be more in touch with the cultivators and know what going on

15?5 **(35) Publication of Liverpool and Bombay prices** —It would be a good thing to publish daily the Liverpool and Bombay cotton prices at up country markets to enable the cultivators to follow the course of the market instead of being mostly in the dark, as is at pres nt the case w th them.

IV —MANUFACTURE

(a) *Ginning and Pressing*

1526 **(36) Type and number of gins and presses** —In Messrs Ralli Brothers Factory at Mirpurkhas there are 62 single roller gins 24 double roller gins and a small American saw gin There is also a cotton press by Henry Berry and Co Leeds turning out ?50 to 300 bales in twelve hours

15?7 **(37) Size of bale** —The size of the bales (400 lbs to 46? lbs net weight) is—

22½ × 22½ × 26 inches up to 2?½ × 22½ × 32 inches } *Shipping measurement 2? up to 2? tons per 100 bales*

15?8 **(38) Saw gins *versus* roller gins** —Ordinarily saw gins are not suitable for *deshi* cotton They

Multan I bought factory at Multan, th elevators worked ear at Nawabshah) cotton was found at

We actually depend

h the factor es

fifty per c nt. of American cotton were to replace fifty hers would be compelled to replace the half of their ginning power by American gins

V.—GENERAL.

1533. (46) **Attitude of buyers to improved cottons.**—Buyers have offered a premium for improved cotton.

1534. (47) **Effect of water rates.**—I do not consider the water rates charged have any effect on the cultivators' preference for a particular crop. In cultivating, the Sindhi *zamindar* takes into consideration; firstly, his personal requirements (*viz.*, *bajra* seed for himself and his family and *bajra* and *juar* fodder for his cattle) and secondly, the safety of each crop and its monetary return. This is the reason why *til* seed being being a very delicate crop is now hardly cultivated in our district.

1535. (48) **Desirability of alteration in water rates.**—I do not consider that any changes are called for in the schedule of water rates at present in force. *In my opinion, the cultivators could easily pay even higher rates, provided the Cotton Committee could induce Government to improve radically the precarious conditions of the water supply of the Jamrao canal.*

Mr. CHANDIRAM LALSINGH, Zamindar, Jamesabad, Thar and Parkar District, Sind.

THIS WITNESS WAS NOT ORALLY EXAMINED.

Written statement.

I.—AGRICULTURAL EXPERIENCE.

(*a*) "*Deshi*" *short staple cotton.*

1536. (1) **Experience.**—I have been growing cotton and have been in touch with some of the cotton cultivators on the Jamrao Canal in the Mirpurkhas and Jamesabad Talukas, of the Thar and Parkar District in Sind, for the last sixteen years.

1537. (2) **Varieties.**—The *zamindars* in the district are familiar with the *deshi* short-staple cotton only.

1538. (3) **Size of holdings.**—I cannot say what the average size of a holding is. But the proportion under cotton is roughly fifteen to twenty per cent.

1539. (4) **Yields and profits.**—The average yield of cotton per acre is about five maunds. Taking about Rs. 8 to be the average selling price per maund, the total yield in rupees comes to Rs. 40. Allowing for the following expenses and contingencies, the net profit to the *zamindar* roughly is Rs. 10 as shown below:—

	Rs.	A.	P.	
1. Jungle clearance and uprooting average	2	0	0	per acre.
2. Ploughing, four turns, average	3	0	0	„
3. Seed, thirteen seers, average	1	0	0	„
4. Weeding, average	8	0	0	„
5. Picking, four pickings, average	5	0	0	„
6. Waterings, ten waterings, average for lift and flow	5	0	0	„
7. Excavation and after clearance	1	0	0	„
8. Supervision, average	1	8	0	„
9. Assessment	3	8	0	„
Total	30	0	0	

1540. (5) **Rotations and manures.**—Cotton is generally preceded by wheat and is followed by fallow. The Jamrao Colony is a new colony and practically no manure is being used. Breaking the soil as much as practicable and exposing it to sun and air is considered sufficient.

1541. (6) **Comparative returns.**—*Deshi* short-staple cotton compares favourably with other *deshi* crops and exotic cottons, because the former is more paying and requires less trouble and anxiety. There is no *deshi* long-staple cotton in the district.

1542. (7) **Conditions affecting increase in area.**—The area under *deshi* short-staple cotton has remained sufficiently steady during the past ten or twelve years ending 1913. Owing to the war, in 1914, the price of cotton suddenly failed owing to the closure of markets and the *zamindars* suffered a great deal. The effect of this was that cotton received a rude set back and the shrinkage of area was reflected in the next years' returns. *Zamindars* were afraid to put more area under cotton lest it might fetch the low price of the last year. Fortunately, the price recovered itself and consequently, more area was put under cotton during the next season. During the year 1917, the Jamrao Canal was closed for 2½ months, the season for the cultivation was sufficiently advanced and consequently a smaller area was brought under *kharif* crop. Unfortunately for the *zamindars*, though the prices for cotton have risen considerably during the current year, the yield of cotton, which was calculated to vary from six to eight annas in the rupee, has suffered recently owing to untimely late and heavy rains and frost, and the yield is scarcely two maunds per acre.

1543. (8) **Uses of seed and seed selection.**—The seed is generally used as fodder for cattle, and oil to a very small extent is extracted from it, though there is no industry in it worth the name. The second picking of cotton is considered to be the best for the extraction of the seed by ginning it in the factories. Seed is not extracted by hand-ginning.

1544. (9) **General economic conditions.**—The condition of cotton-growers is by no means very satisfactory. They have to combat with various unforeseen factors, *e.g.*, white-ants, blight, boll-worm and frost. The labour difficulty is not easy to overcome; of late years owing to copious rainfall, the labour, which is generally composed of Tharis and Marwaris, has left the Jamrao Tract, owing to prospects of good crops in the desert. Consequently the labour has been scarce and fetches a very high wage. The scarcity has become chronic owing to the effects of malaria too.

(c) *Exotic cotton*

V.—GENERAL.

1546 (46) **Attitude of buyers to improved cottons.**—The only buyers for American cotton were Messrs Greaves, Cotton and Tata, who established their agency in Mirpurkhas The premium they offered was about Rs 2 The price which we got for American cotton in 1914 or 1915 was Rs 6 4 0 only This was not high enough to encourage the growth of the American variety *Zamindars* would have required a higher premium than this I have referred to this in the preceding paragraph.

1547 (47) **Effect of water rates.**—There is no separate charge for water The water rate is included with land revenue under combined assessment.

1548 (49) **Effect of tenure of land.**—I do not think the tenure, on which land is held, would affect the extension of cotton cultivation in this district

V.—General.

1533. (46) **Attitude of buyers to improved cottons.**—Buyers have offered a premium for improved cotton.

1534. (47) **Effect of water rates.**—I do not consider the water rates charged have any effect on the cultivators' preference for a particular crop. In cultivating, the Sindhi *zamindar* takes into consideration; firstly, his personal requirements (*viz.*, *bajra* seed for himself and his family and *bajra* and *juar* fodder for his cattle) and secondly, the safety of each crop and its monetary return. This is the reason why *til* seed being being a very delicate crop is now hardly cultivated in our district.

1535. (48) **Desirability of alteration in water rates.**—I do not consider that any changes are called for in the schedule of water rates at present in force. *In my opinion, the cultivators could easily pay even higher rates, provided the Cotton Committee could induce Government to improve radically the precarious conditions of the water supply of the Jamrao canal.*

Mr. CHANDIRAM LALSINGH, Zamindar, Jamesabad, Thar and Parkar District, Sind.

This Witness was not orally examined.

Written statement.

I.—Agricultural Experience.

(*a*) "*Deshi*" *short staple cotton.*

1536. (1) **Experience.**—I have been growing cotton and have been in touch with some of the cotton cultivators on the Jamrao Canal in the Mirpurkhas and Jamesabad Talukas, of the Thar and Parkar District in Sind, for the last sixteen years.

1537. (2) **Varieties.**—The *zamindars* in the district are familiar with the *deshi* short-staple cotton only.

1538. (3) **Size of holdings.**—I cannot say what the average size of a holding is. But the proportion under cotton is roughly fifteen to twenty per cent.

1539. (4) **Yields and profits.**—The average yield of cotton per acre is about five maunds. Taking about Rs. 8 to be the average selling price per maund, the total yield in rupees comes to Rs. 40. Allowing for the following expenses and contingencies, the net profit to the *zamindar* roughly is Rs. 10 as shown below:—

	Rs.	A.	P.	
1. Jungle clearance and uprooting average	2	0	0	per acre.
2. Ploughing, four turns, average	3	0	0	„
3. Seed, thirteen seers, average	1	0	0	„
4. Weeding, average	8	0	0	„
5. Picking, four pickings, average	5	0	0	„
6. Waterings, ten waterings, average for lift and flow	5	0	0	„
7. Excavation and after clearance	1	0	0	„
8. Supervision, average	1	8	0	„
9. Assessment	3	8	0	„
Total	30	0	0	

1540. (5) **Rotations and manures.**—Cotton is generally preceded by wheat and is followed by fallow. The Jamrao Colony is a new colony and practically no manure is being used. Breaking the soil as much as practicable and exposing it to sun and air is considered sufficient.

1541. (6) **Comparative returns.**—*Deshi* short-staple cotton compares favourably with other *deshi* crops and exotic cottons, because the former is more paying and requires less trouble and anxiety. There is no *deshi* long-staple cotton in the district.

1542. (7) **Conditions affecting increase in area.**—The area under *deshi* short-staple cotton has remained sufficiently steady during the past ten or twelve years ending 1913. Owing to the war, in 1914, the price of cotton suddenly failed owing to the closure of markets and the *zamindars* suffered a great deal. The effect of this was that cotton received a rude set back and the shrinkage of area was reflected in the next years' returns. *Zamindars* were afraid to put more area under cotton lest it might fetch the low price of the last year. Fortunately, the price recovered itself and consequently, more area was put under cotton during the next season. During the year 1917, the Jamrao Canal was closed for 2½ months, the season for the cultivation was sufficiently advanced and consequently a smaller area was brought under *kharif* crop. Unfortunately for the *zamindars*, though the prices for cotton have risen considerably during the current year, the yield of cotton, which was calculated to vary from six to eight annas in the rupee, has suffered recently owing to untimely late and heavy rains and frost, and the yield is scarcely two maunds per acre.

1543. (8) **Uses of seed and seed selection.**—The seed is generally used as fodder for cattle, and oil to a very small extent is extracted from it, though there is no industry in it worth the name. The second picking of cotton is considered to be the best for the extraction of the seed by ginning it in the factories. Seed is not extracted by hand-ginning.

1544. (9) **General economic conditions.**—The condition of cotton-growers is by no means very satisfactory. They have to combat with various unforeseen factors, *e.g.*, white-ants, blight, boll-worm and frost. The labour difficulty is not easy to overcome; of late years owing to copious rainfall, the labour, which is generally composed of Tharis and Marwaris, has left the Jamrao Tract, owing to prospects of good crops in the desert. Consequently the labour has been scarce and fetches a very high wage. The scarcity has become chronic owing to the effects of malaria too.

(c) *Exotic cotton*

their holdings with American cotton has been removed during the last two seasons

V —General.

1546 (46) **Attitude of buyers to improved cottons** —The only buyers for American cotton were [illegible]

1547 (47) **Effect of water rates** —There is no separate charge for water The water rate is included with land revenue under combined assessment.

1548 (49) **Effect of tenure of land** —I do not think the tenure on which land is held would affect the extension of cotton cultivation in this district